THE ATOM

Los Alamos Scientific Laboratory October, 1970

LOS ALAMOS NATIONAL LABORATORY
3 9338 00847 0709

Volume 7 Number 9
October, 1970

THE ATOM

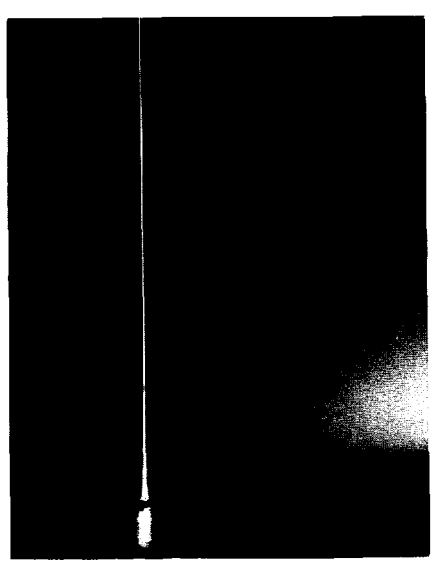
Published by the University of California, Los Alamos Scientific Laboratory, Office of Public Relations, P. O. Box 1663, Los Alamos, New Mexico 87544. Second Class Postage Paid at Los Alamos.

CONTENTS:

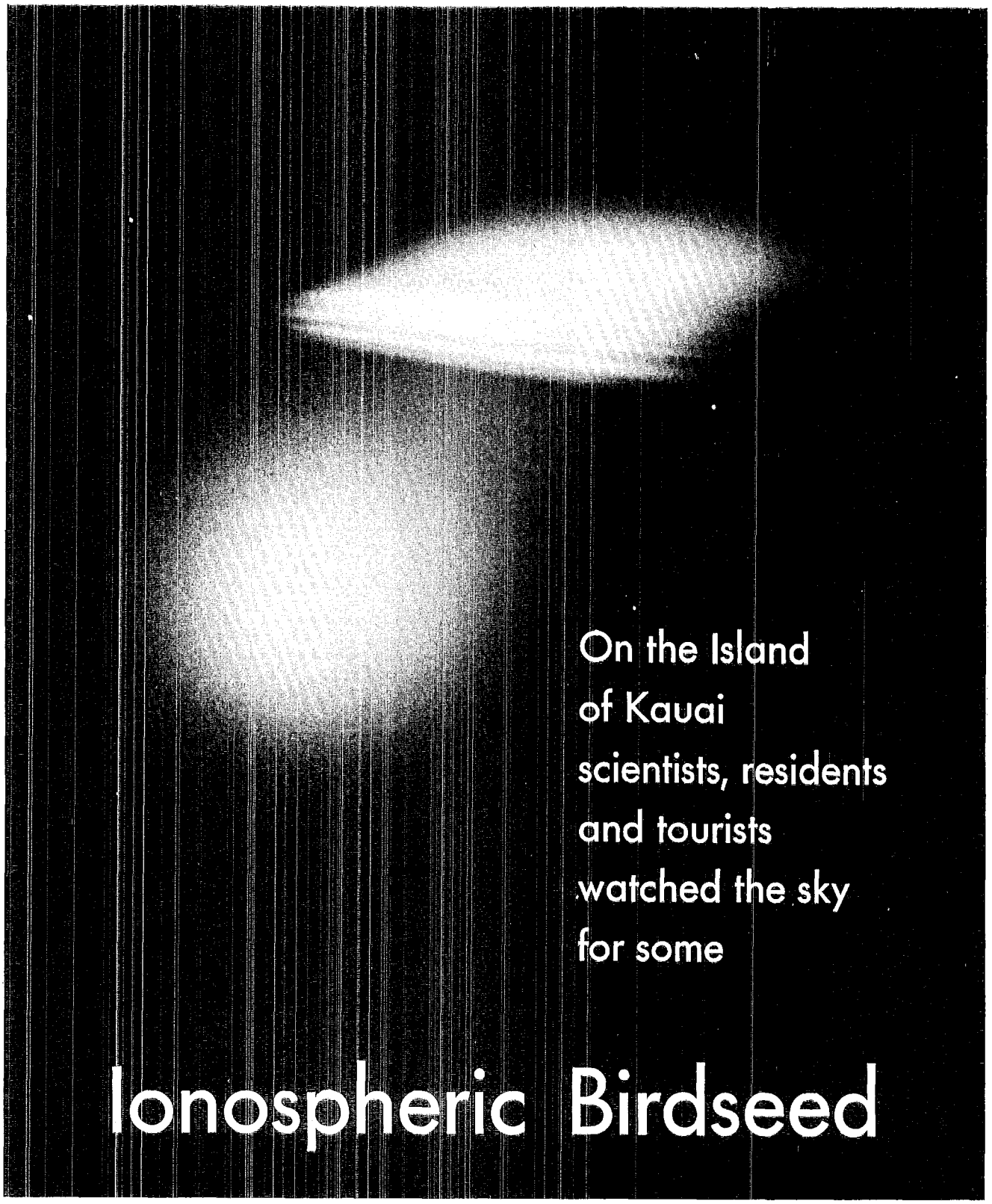
Editor: Kenneth J. Johnson
Photography: Bill Jack Rodgers and Bill Regan

Office: D-413 Administration Building. Telephone: 667-6102. Printed by The University of New Mexico Printing Plant, Albuquerque.

Los Alamos Scientific Laboratory, an equal opportunity employer, is operated by the University of California for the United States Atomic Energy Commission.



COVER:
Taken from the Pacific Missile Range tracking station on Makaha Ridge, the fiery trails of two rockets appear almost as one in the cover photograph taken by PUB-1 Photographer Bill Jack Rodgers. The launches were part of the Birdseed series and were nicknamed Egret and Titmouse. The story, by Charles Mitchell, PUB-DO, begins on page one.



On the Island of Kauai scientists, residents and tourists watched the sky for some

Ionospheric Birdseed

After the barium is released in the ionosphere the neutral barium cloud (lower cloud in this photo) is promptly visible. More slowly, a pink/violet ionized cloud is formed. The striations, the horizontal lines in the top cloud caused by and aligned with Earth's magnetic field, are of prime interest to scientists studying the ionosphere.

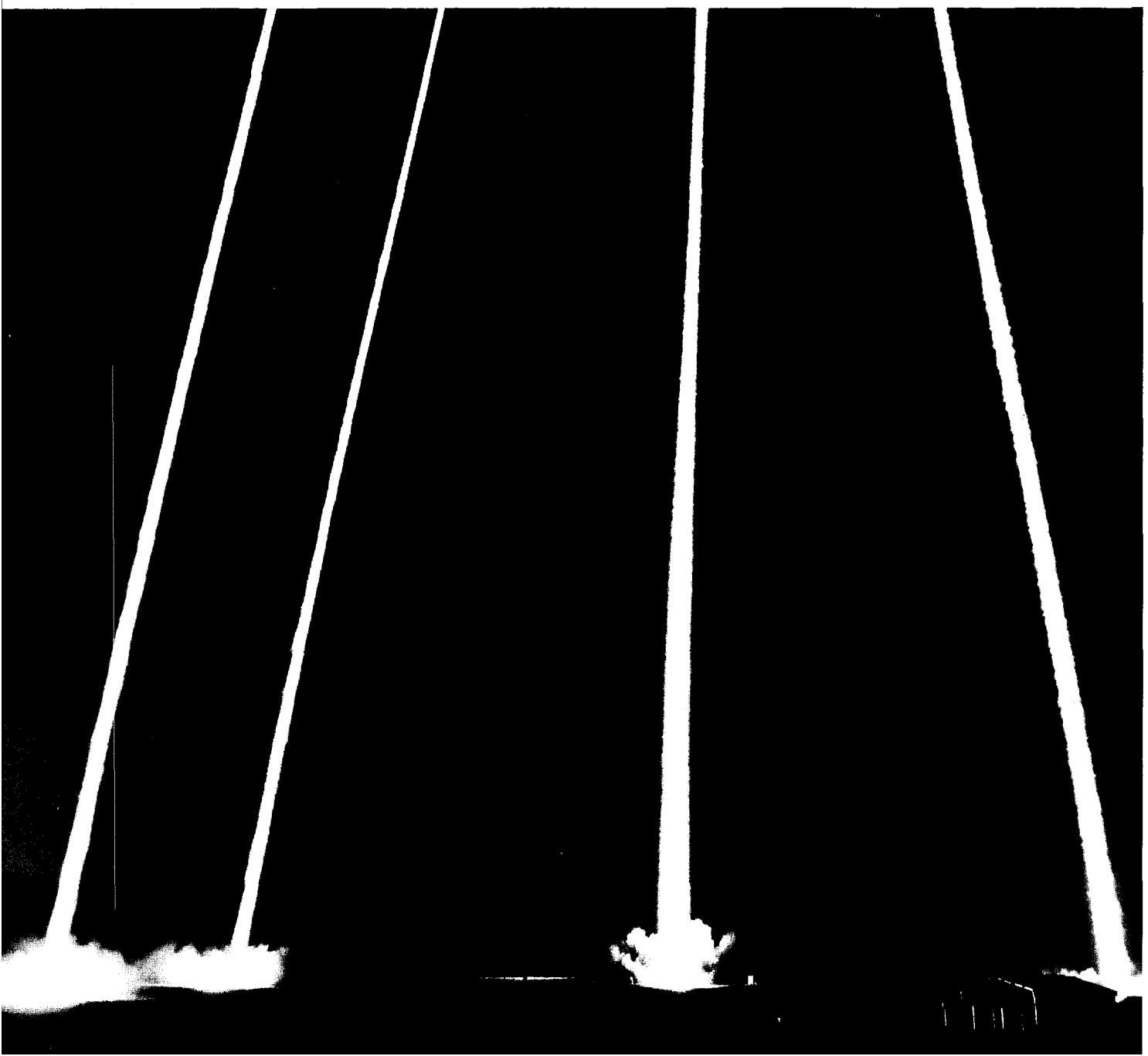
By Charles Mitchell

Protected by a steel-reinforced roof and a 15-foot-high earth and timber wall at the Pacific Missile Range on the island of Kauai, a group of people from the Los Alamos Scientific Laboratory waited for the launch of the first rocket of the Birdseed series. The island residents and hundreds of tourists, notified of the test by radio and newspapers, also waited, looking northward high above the Na Pali coast.

At dusk, the Nike Tomahawk rocket, dubbed "Roadrunner," hurled its barium payload into the ionosphere more than 200 kilometers above the island.

The purpose of this barium launch, and subsequent launches of the Birdseed series, was to study the chemistry and physics of the ionosphere. The ionosphere is that layer around Earth from 40 to 600 miles up. In technical language, it is the lowest layer of the magnetosphere, that greater area in space containing such phenomena as the Van Allen belts. The reason for such interest in the ionosphere is that this relatively thin layer is held by Earth's gravitation and ionized by solar radiation. Fluctuations in the characteristics of the ionosphere can govern our environment. These characteristics: its temperature, magnetic

This photograph, a multiple exposure, was taken over a period of about three hours. It shows the launches of Duck, Sapsucker and two diagnostic probes. Egret was a plasma gun launch. Titmouse delivered a barium cannister.



fields and composition, are of vital interest in such diverse areas as high temperature technology, plasma physics, upper atmospheric chemistry and physics, and certain topics relating to space travel. The LASL Birdseed series used two different devices to study the ionosphere: barium releases and plasma guns.

Barium releases are a relatively common and well understood means of studying the ionosphere. In a typical barium release, a cannister of barium thermite, weighing 16 kilograms, is launched at twilight. At a predetermined time after launch two igniters set fire to the thermite, and the heat generated sprays the barium out of the cannister into the ionosphere. These shots are launched at twilight so that, while the sky is dark to the ground observers, the barium is exposed to the sun's rays at event altitude. After release, the neutral barium cloud (which scatters sunlight) is promptly visible. More slowly, solar ultraviolet radiation ionizes the neutral barium, forming a pink/violet ionized cloud, which also scatters visible solar radiation. The ionized cloud then moves under the influence of magnetic and electric fields and separates from the neutral cloud.

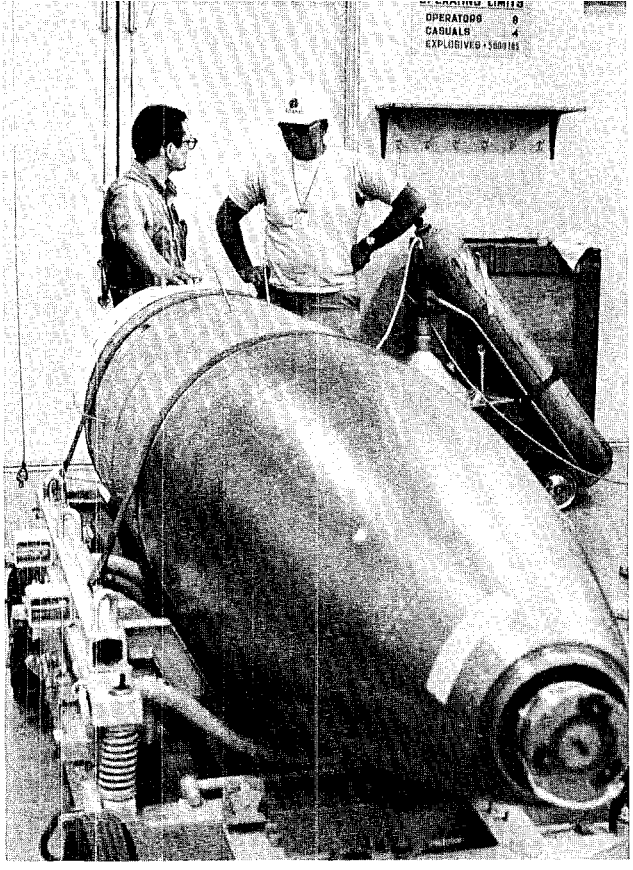
Of prime interest to the researchers are the pink striations (streaks) caused by, and aligned with Earth's magnetic field. The way these striations are formed, and how they move, give insight into some of the more scientifically interesting characteristics of the ionosphere.

On Kauai, a barium release was launched about two hours before each of the plasma gun shots. The plasma guns were then launched into the same area as the barium, essentially using the point where the barium event had been as a target.

While barium releases are considered almost routine by many researchers, the launching, firing of, and retrieval of information from a plasma gun launch was entirely new. Herman Hoerlin, J-10 group leader, and Donald Kerr of that group, originated the idea of launching a plasma gun for such studies. It was hoped that, by injecting a plasma stream (a stream of high velocity, highly ionized gas) into the ionosphere, additional information could be gathered to enhance what was learned from the barium releases.

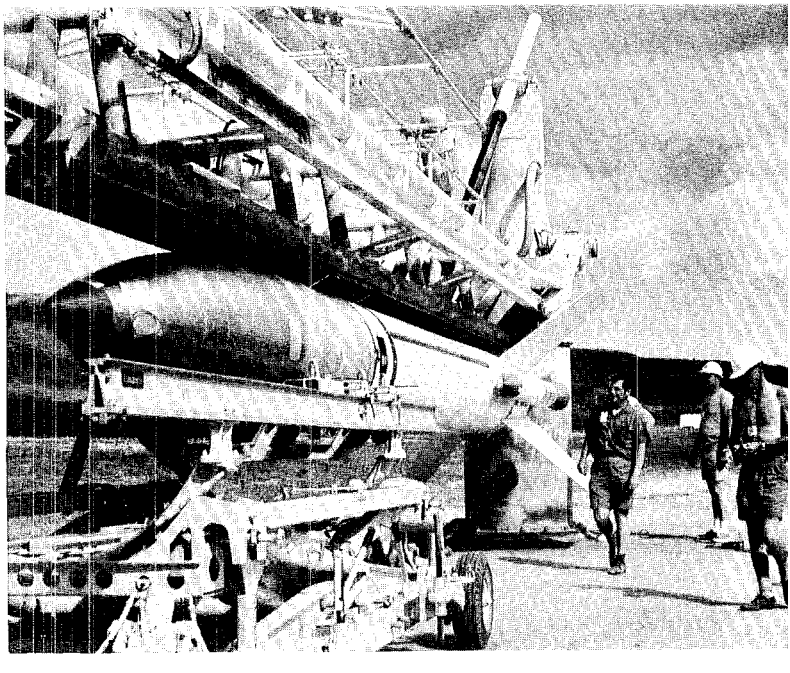
The plasma guns, and the associated small, but very powerful, power supplies required to ionize and discharge the plasma were designed and tested at Los Alamos. The flight hardware was fabricated and assembled by Sandia Laboratories, Albuquerque.

continued on next page



Ivars Henins, P-17, and Floyd Adams, Sandia launch director discuss the payload for the Duck rocket launch.

Max Fowler, GMX-6 assistant group leader, left, and coworker Dave Thomson (partially hidden), watch the preparation of the Duck vehicle on its launch pad. At right are Adams and Jim May, both of Sandia Laboratories.



John Marshall and Ivars Henins, of P-17, developed the plasma gun. Marshall has been working with accelerating plasmas for years in the Laboratory's Project Sherwood. They designed a device which would fit well with a small-size, high output power supply; produce and accelerate a plasma; and fit within the restrictive dimensions of the rocket playload. Marshall and Henins also worked closely with Max Fowler of GMX-6 on the electrical requirements of the power supply. Grenfell Boicourt and Ed Kemp, both of P-16, supplied information on the high energy capacitors to be used as the initial power source of the assembly.

The final plasma gun, one of two launched from Kauai, was deceptively simple looking, being a coaxial device (a tube within a tube). Its operation sounds simple too, although almost two and one-half years were spent in its development.

In the plasma gun, a small gas reservoir holds 43 milligrams of neon gas in the center electrode. This gas is released into the area between the two concentric cylinders by a fast-acting valve. After only 1.2 thousandths of a second, when the escaping gas has filled the plasma gun, the power supply provides a negative high voltage to the center electrode (or cylinder). This voltage breaks down the gas, making it into a plasma which is magnetized by the large electric currents between electrodes. There is a difference in the strength of the magnetic field from one end of the gun to the other. Since one magnetic field works against another, just as with "toy" magnets, the magnetic pressure difference "pushes," or accelerates, the plasma out of the gun muzzle. Beyond the area of the gun electrodes, a combination of magnetic and kinetic energy causes a large portion of the plasma to be compressed into a "pinch." These combined effects of acceleration and pinch produce a demagnetized, heated plasma which expands axially away from the gun muzzle much like the gas from a rocket nozzle.

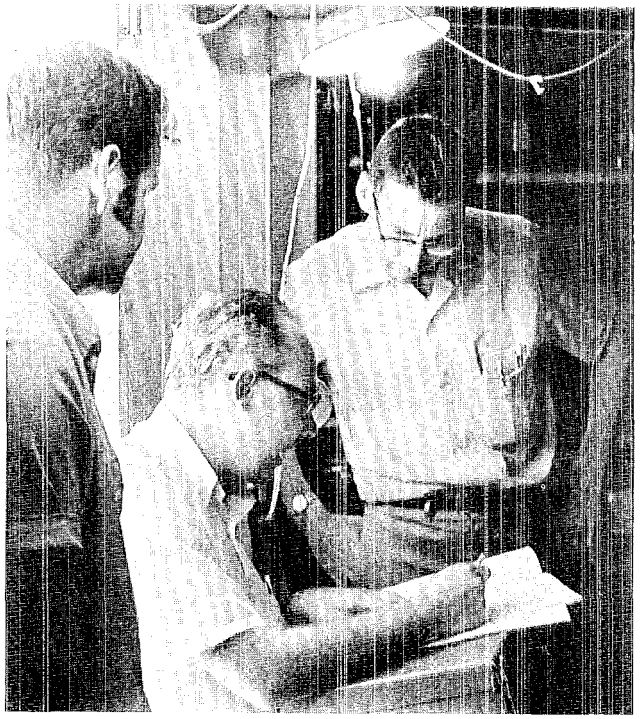
Concurrent with the design of the plasma gun, work was proceeding on developing a power supply suitable in output and size. There were two very basic requirements which governed its design: electrical requirements of the plasma gun and size/weight limitations set by the rocket to be used for launch. Fowler and his associates, Dave Thomson, Wray Garn and Bob Caird, set to work to design an explosive power supply which would meet the plasma gun electrical requirements and fit in a payload vehicle 11 feet long and two and one-half feet in diameter. They were allowed about 500 pounds gross weight for the supply. The plasma gun itself and other equipment, such as the guidance packages, had to fit into this space also. An explosive type power supply was chosen because the energy contained in explosives is much higher than that in capacitor banks per unit of weight. (While a high density capacitor contains about 100 joules of energy per pound, high explosives contain over 2,000,000 joules per pound).

The explosive power supply is simple in principle but was extremely difficult to develop. Basically, explosive energy is converted to magnetic energy by compression of magnetic flux as the explosive forcibly reduces the inductance of the flux enclosing circuits. To accomplish this, the power supply consists, in simplest form, of a spiral winding around a metal cylinder filled with high explosive. A small capacitor bank supplies the initial electrical current (flux) to the spiral wound coil. The explosive is detonated at such a time that the metal "can" which holds the explosive will expand and short out the coil at about maximum current. Since the explosives are detonated at the ends of the coils, the "cans" wipe the coils, multiplying the power and "pushing" the current to the plasma gun terminals. For an idea of the power multiplication of this supply, the capacitor bank used to supply the initial flux produced 14,000 joules of energy at about 8,000 amperes. After the explosive supply had done its work, the energy delivered to the plasma gun was 350,000 joules at 1,700,000 amperes and a power of 40 billion watts. In terms of raw power, the output to the plasma gun was 20 times greater than the generating capacity of Grand Coulee dam.

Having been supplied the "tools" for the plasma gun by Marshall, Fowler and their associates, J-10, under the direction of Hoerlin, had to have the barium cannisters and plasmas guns launched, then concentrate on retrieving and interpreting all of the information they could from their experiments. All of this information had to be taken by "looking" at the event more than 200 kilometers straight up.

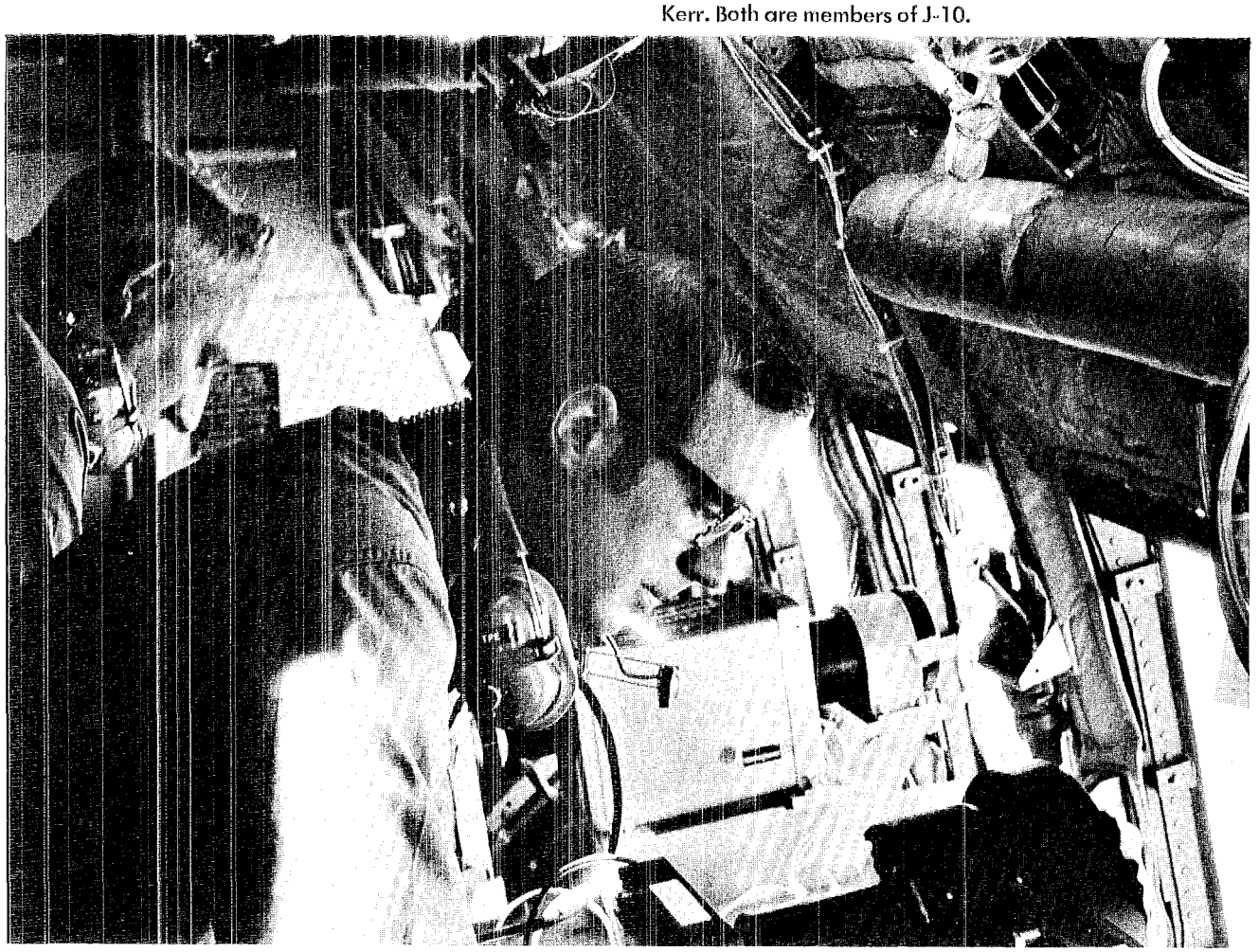
Milt Peek, J-10 associate group leader and LASL test coordinator, had two very basic requirements for "looking" at the five LASL shots. Both the barium shots (nicknamed Roadrunner, Sapsucker and Titmouse) and the plasma gun launches (called Duck and Egret) required absolutely clear visibility from the ground to event atitude. In addition, the experimenters had to know, in advance, exactly where the event was to take place in the night sky.

continued on page 6



Bruce Burkheimer, P-17, John Beardall, J-10, and Thomson, discuss weather predictions prior to a launch.

At the instrumentation windows of the NC-135 aircraft are Casey Stephens and the craft's scientific commander Don Kerr. Both are members of J-10.



The first requirement was taken care of by careful weather prediction and the work of John Beardall of J-10. Beardall's prime contribution to the series was the radiometric calibration of image intensifier cameras and other sensors, but when the long nights started he became Firefly on the communications net. Firefly's job was to search the night sky with a powerful searchlight for any clouds that might have drifted in. Beardall's spotlight was nicknamed his "tail."

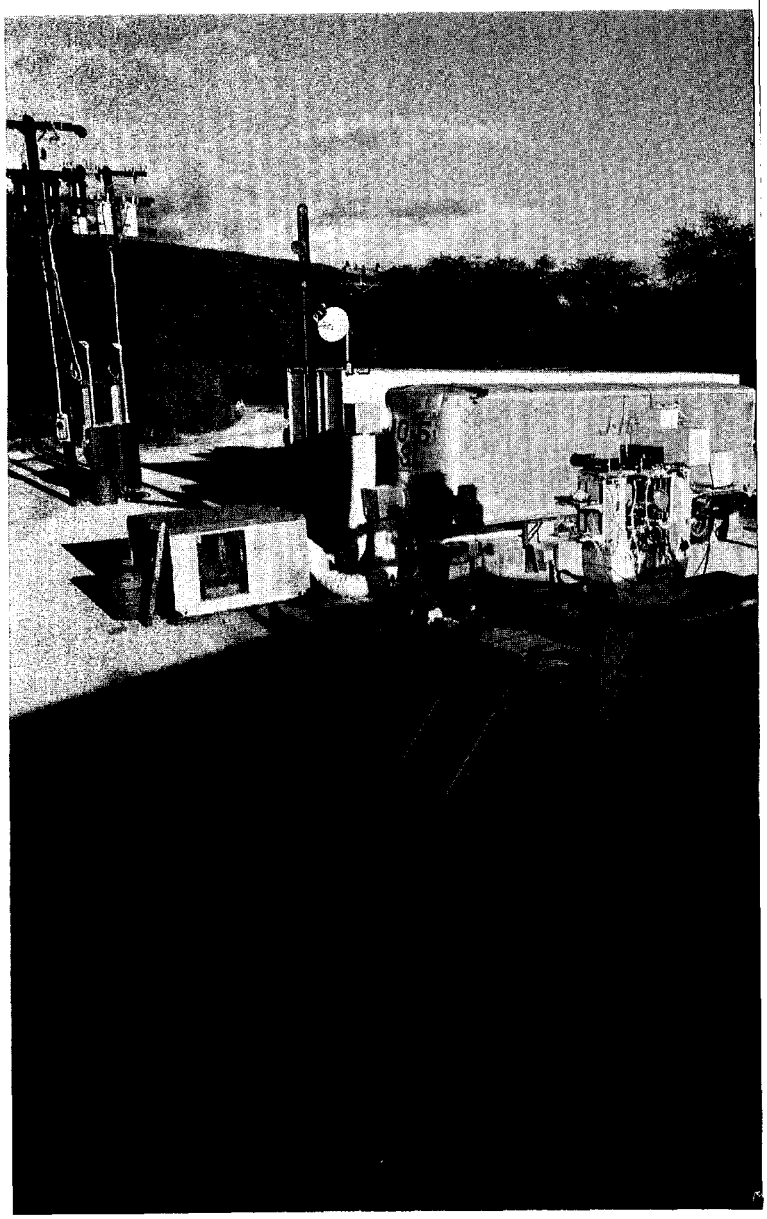
The second requirement was handled by the Pacific Missile Range (PMR) radar and computers. Using a computer program devised by John Davis of PMR, the radar tracked the payload after launch and made rapid and highly accurate predictions of where the event—barium or plasma gun —would take place.

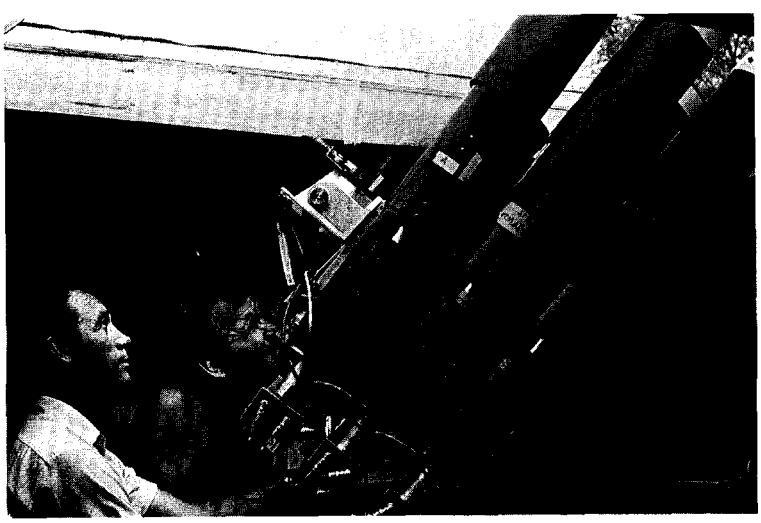
These predictions were teletyped to Kerr, the scientific aircraft commander in one of the Atomic Energy Commission's NC-135 flying laboratories, and to the ground observation stations. Other information, such as weather conditions, schedule progress and time "hacks" was given to Firefly, the aircraft, the observation station on Maui and other areas by Peek. Peek and Jim Wells, of J-1, operated the communications net at the command post. Peek's responsibility was to coordinate all of the field operations for the series. His decisions governed operations at the Barnyard (the LASL ground station so named because of the strange collection of livestock—rockets), the Kokee NASA satellite tracking station, PMR, Maui and the aircraft. Working closely with Al Huters, the Sandia test director, Peek had to constantly evaluate the total situation and, with the help of Wells, keep all stations informed of the test status. The CP where Peek and Wells were located was nicknamed Chili Picker.

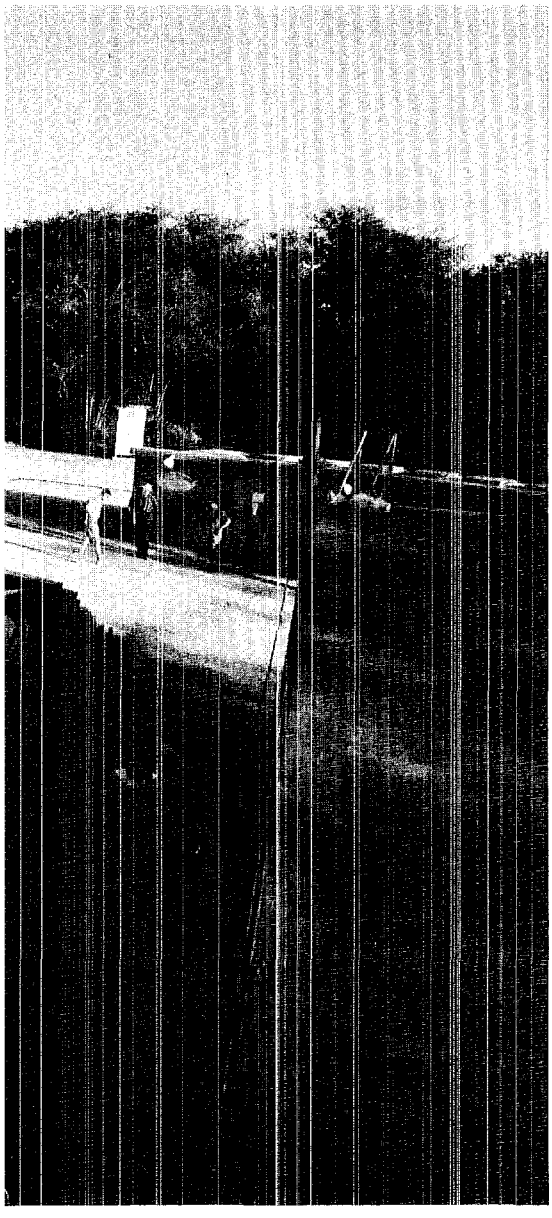
From the aircraft and the Barnyard the events were observed with dozens of instruments. The aircraft mounted basically eight types of instruments for observing each event: an eight-channel photometer, intensified-image orthicon, image orthicon, image-intensified Mitchell camera, auroral cameras, Mitchell cameras, all-sky cameras and streak cameras. In addition to duplicating this instrumentation, the Barnyard used a two-channel photometer, intensified spectrographs, and an interferometer.

The eight-channel photometer was used to record air fluorescence with high sensitivity. The intensified-image orthicon is a high-sensitivity system providing an image of the Birdseed plasma

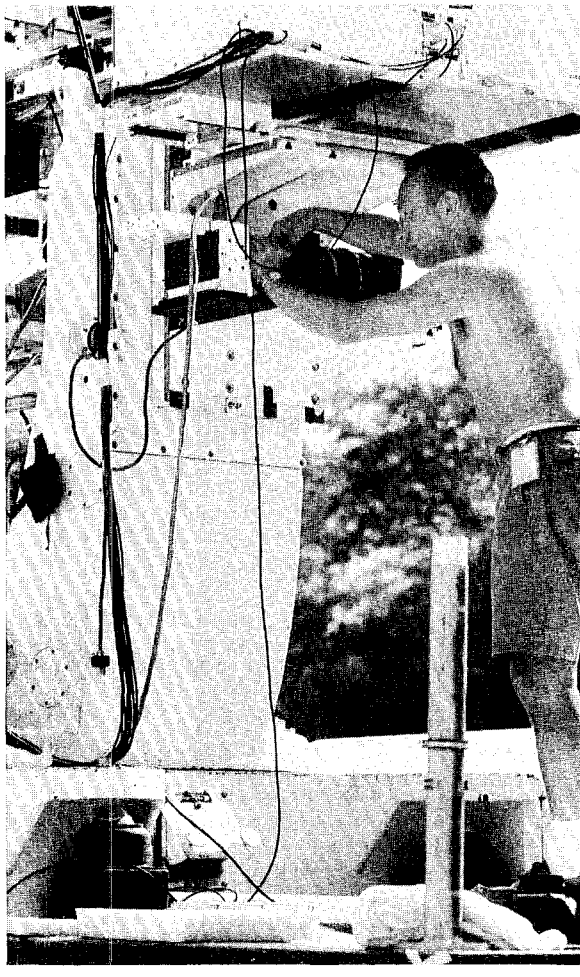
continued on page 8







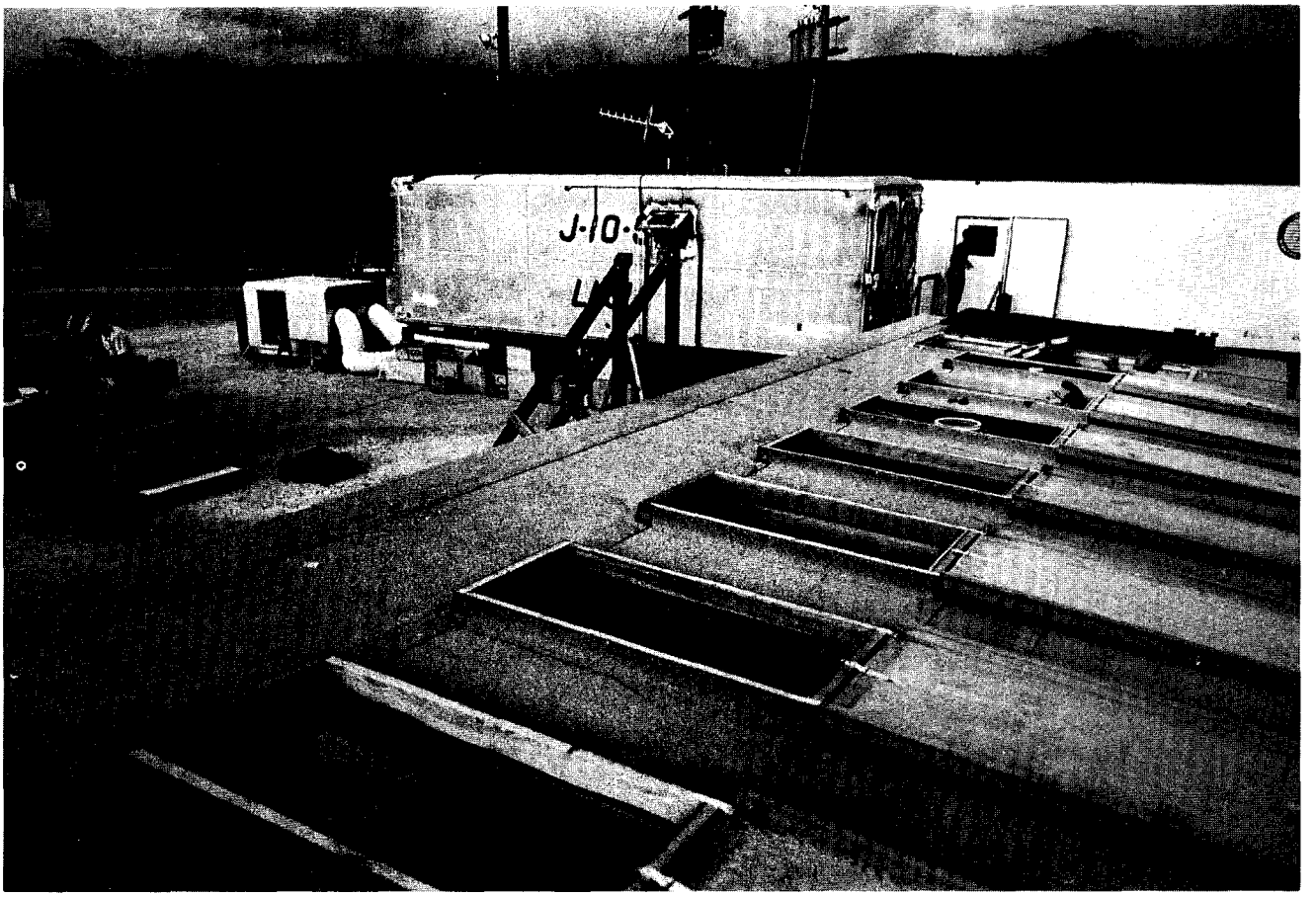
Left, the large tracking camera mount used during the Birdseed launches was located in the center of the Barnyard.



Right, Bruce Stewart, J-10, adjusts one of the many cameras on the Barnyard tracking mount.

Below, Bob Brownlee, J-DO, Herman Hoerlin, J-10 group leader, and Milton Peek, J-10 associate group leader, listen to Al Huters, Sandia test director, explain a tracking problem.

Left, Ken Green, J-10, and Burkheimer, align one of the 10 instruments housed in the Pig Pen.



Thomson and Green check cloud conditions from the Pig Pen's instrument ports.

deposition. Image orthicons backed-up the intesified models and expanded the range of coverage. Image-intensified Mitchell cameras covered, with high resolution, specific situations of plasma shape at intermediate to long distances from the gun. Large fields of view with high sensitivity were covered with the auroral cameras. These cameras could also do rough spectral analysis. The Mitchell cameras were used to back up the image-intensified Mitchells. In case of a gross error in event prediction or aircraft heading, the all-sky cameras were used to guarantee some data return. Diagnostic information on plasma velocities with high time and spatial resolution was obtained with the streak cameras.

Kerr and the crew of the aircraft flew a predetermined flight plan in order to be in the proper place at the proper time to aim their instruments. Some of the instrumentation at the Barnyard, under the direction of "Rooster" (J-10's Bob Jeffries), was aimed by a tracking camera mount. The mount held 13 separate instruments. Ten more devices were housed in the "Pig Pen," a temporary wooden shed, and were aimed through openings in its roof. In all, for the plasma gun shot, there were 40 separate pieces of equipment aimed at the event point, not counting the tracking radar and some instrumentation on Mt. Haleakala. Data from the barium releases on such effects as brightness and drift was obtained from 29 instruments.

The arduous work, culminating in the Birdseed series, began two and one-half years prior to the event. The critical testing of the full-scale plasma gun/power supply had been successfully accomplished at Ancho Canyon site. The barium canisters were readied. Yet, during all of this, J division was also involved in working out the logistics of conducting the series and scheduling for shipping different materials and different people to different places at different times.

There were two main reasons for choosing the Pacific Missile Range for the Birdseed series: it has

the only AEC facility for rocket launching capabilities with the associated tracking radar and computers, as well as the entire Pacific Ocean as an impact area.

As a part of the overall planning and preparation, J division scheduled the shipment of one-quarter million pounds of material, ranging from small camera filters to entire loaded trailers, the 3,200 miles from Los Alamos to Kauai. It also housed, transported and provided facilities and vehicles for the LASL personnel.

Supply and Property department carried out these plans and got everything to exactly the right place at exactly the right time. Its members, who actually did the physical handling of the shipments, sent things by both air and sea. Men and material also traveled by both common carriers and the NC-135 aircraft.

Not all personnel were based on Kauai. Some were at Hickam Air Force Base in Honolulu. Many men were required to travel back and forth between Kauai, Honolulu and the observation station on the island of Maui.

Almost 10,000 pounds of equipment were shipped on the NC-135 aircraft. While there were already some support trailers on the island, others were shipped from Los Alamos. These trailers were used as offices, labs, and photographic processing centers.

Supply and Property department shipped almost all of the quarter million pounds of equipment on such a schedule that the LASL portions of the site could be set up, checked out and ready for use in time for the launchings in May of this year. The logistics took into account that Sandia had to launch 25 rockets in one month so that timing was critical.

A look at a part of the Birdseed schedule serves as a good example. On schedule, equipment was delivered to Supply and Property Department at Los Alamos in the second week of April for air shipment to Kauai. The schedule went on: April 24, Barnyard trailers in place; April 26, Barnyard tracker personnel on station; May 6, payloads arrive at Kauai; May 12, all equipment to be shipped on the NC-135 to be at Kirtland pad; May 13-19, first barium launch (Roadrunner) scheduled for aircraft participation if possible. Such overlapping and complex scheduling went on and on.

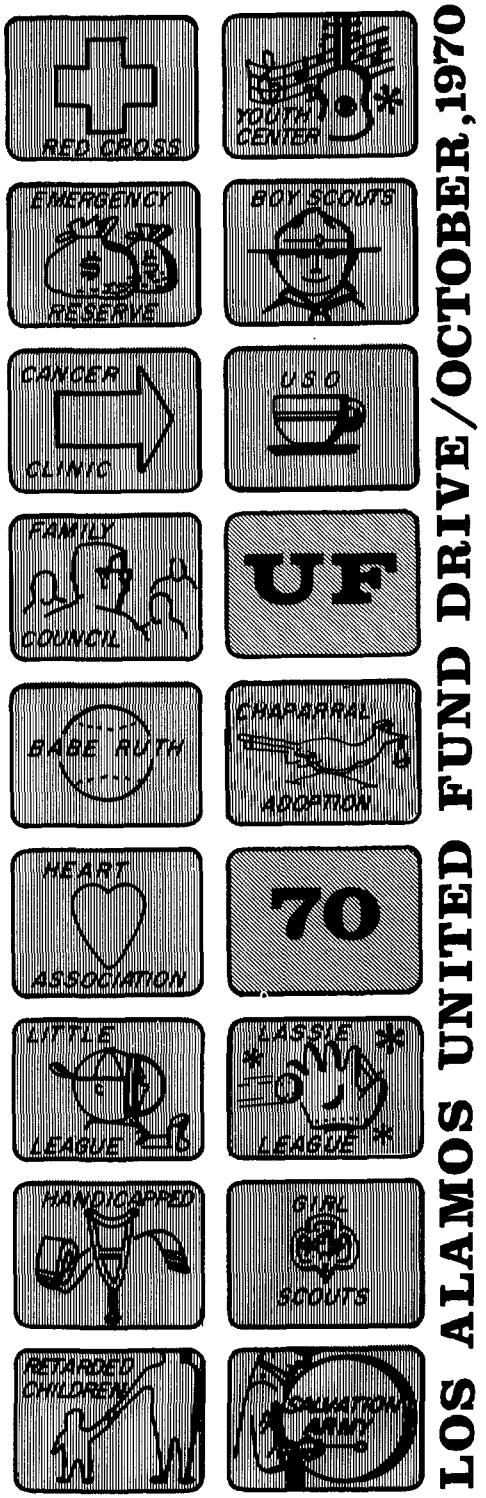
As each piece of this large logistics puzzle fell into place, the date of firing drew nearer, and all of the personnel fell under a heavier load. Earl Rutledge of J-1 was "our man in Hono." He arranged for equipment arriving at Hickam Air Force Base to be shipped on to Kauai or installed at Hickam as needed. He also handled personnel with equal facility. Since the NC-135's and large commercial aircraft can't land on the small field at Kauai, Rutledge saw to it that people who were staying in Honolulu were situated and that those who were going on to Kauai actually got there. He was welcome committee, cargo loader, cargo unloader, expediter, and liaison man.

After arrival of the men and equipment, the hard physical labor of preparing launch vehicles, setting up instrumentation, trailers and temporary buildings began. The CP had been the site of hurried conversations between Chili Picker, Hutters, and Bob Valencia of PMR's computing facility. The blackboards at the Sandia trailer complex were covered with constantly updated launch schedules. Everyone watched the sky for clouds. The clogged water filters which made photo processing impossible had been fixed. The broken air conditioner on one of the trailers had been replaced; the Teletype which printed nonsense had been repaired.

Two and one-half years of work on design and development; months of preparation, transporting men and equipment to Kauai; days of test flights, dry-runs, and briefings; all came to five launches from which masses of data were taken to expand man's knowledge of the ionosphere.

Alan Olcott, J-1 (adjusting the scale) and Rod Biddle, J-16, check the weight of equipment returning to LASL. Ray Harvey, SP-2, at left in background, supervises two workmen at Hickam Air Force Base who are unloading a forklift.

Los Alamos United Fund Seeks $66,000



LOS ALAMOS UNITED FUND DRIVE/OCTOBER, 1970

The annual Los Alamos United Fund campaign will begin this month aimed at a goal of $66,000. Of the total, $62,000 will be used in direct support of 14 of the participating agencies. The Lassie League, although a participating agency, has again requested no funds for this year. An emergency reserve of $4,000 is included in the goal to help member agencies meet unforeseen expenses such as those which arise from disasters, to assist agencies which unexpectedly lose other sources of income, and to absorb the expenses incurred in conducting the campaign which amounts to one to one and a half per cent of the goal figure. Most of the funds collected in the campaign are earmarked for activities in Los Alamos and the immediate surrounding area.

Citizens will be contacted at their places of employment with the exception of the retired segment of the population which will be solicited by J. M. B. Kellogg. Gilbert Ortiz, Mail and Records department, assisted by David Heimbach who heads the department, will conduct the campaign at the Laboratory. Donald Green will conduct the Zia Company campaign; Harold Valencia, Atomic Energy Commission and other governmental offices; William Strickfaden, the business community; Ed Spence, schools; Gene Pollard, Los Alamos County; Dr. Anne Wadstrom, Medical Center.

Both local banks have again agreed to accept monthly bank deductions as a convenient way for citizens to contribute. Contributions can also be made in cash or on the installment plan.

Joe Perry, president of the Board of Trustees, and Charles Tallman and John Hafer, co-chairmen of the Campaign Advisory Committee, all of N-4, noted the "fair share" guide for contributions used in previous campaigns is still current. By this formula, United Fund officials suggest a contribution that is equivalent to one hour per month (equal to about 6/10 of one per cent of gross annual salary). For example, if a person's hourly wage is $3, a contribution of $36 would meet this criterion. For a person whose annual salary is $12,000, a fair share amount would be $72. The United Fund officials, also pointed out that if every family in Los Alamos gave $16, the goal would be passed.

Among the 14 organizations that will receive support from the Los Alamos United Fund is the Chapparral Adoption Agency which was admitted this year as a new member. The CAA is a non-profit, private organization which works to help place infants in adoptive homes and helps to support a home for unwed mothers in Albuquerque. The statewide organization has a board member in Los Alamos to assist people who wish to adopt a child. It is scheduled to receive $600 in United Fund support.

The Board of Trustees voted to drop support of the New Mexico Council of the National Council on Crime and Delinquency this year.

Other agencies that will receive support from the United Fund are the Babe Ruth League which will receive $1,900; Boy Scouts, $9,800; Cancer Clinic, $7,000; Family Council, $8,000; Girl Scouts, $9,800; Heart Association, $4,000; Little League, $900; Physically Handicapped, $600; Red Cross, $6,200; Retarded Children, $4,700; Salvation Army, $6,800; United Services Organization, $700; and the Youth Center, $1,000.

Margaret Brown, P-10, demonstrates manual scanning.

One job the human still does better than the machine is reading nuclear track plates, but

machines are getting better all the time

Counting the tiny tracks of nuclear and subnuclear particles on a photographic plate is a slow and tedious job for a human peering through the binoculars of a microscope. But the human eye is still the best bet. Technology has not yet advanced to the point where a machine can do the job as well as man. Nevertheless, scientists have been continually developing new machines to supplement human scanning over the past several years and, as a result, the machines are getting better all the time.

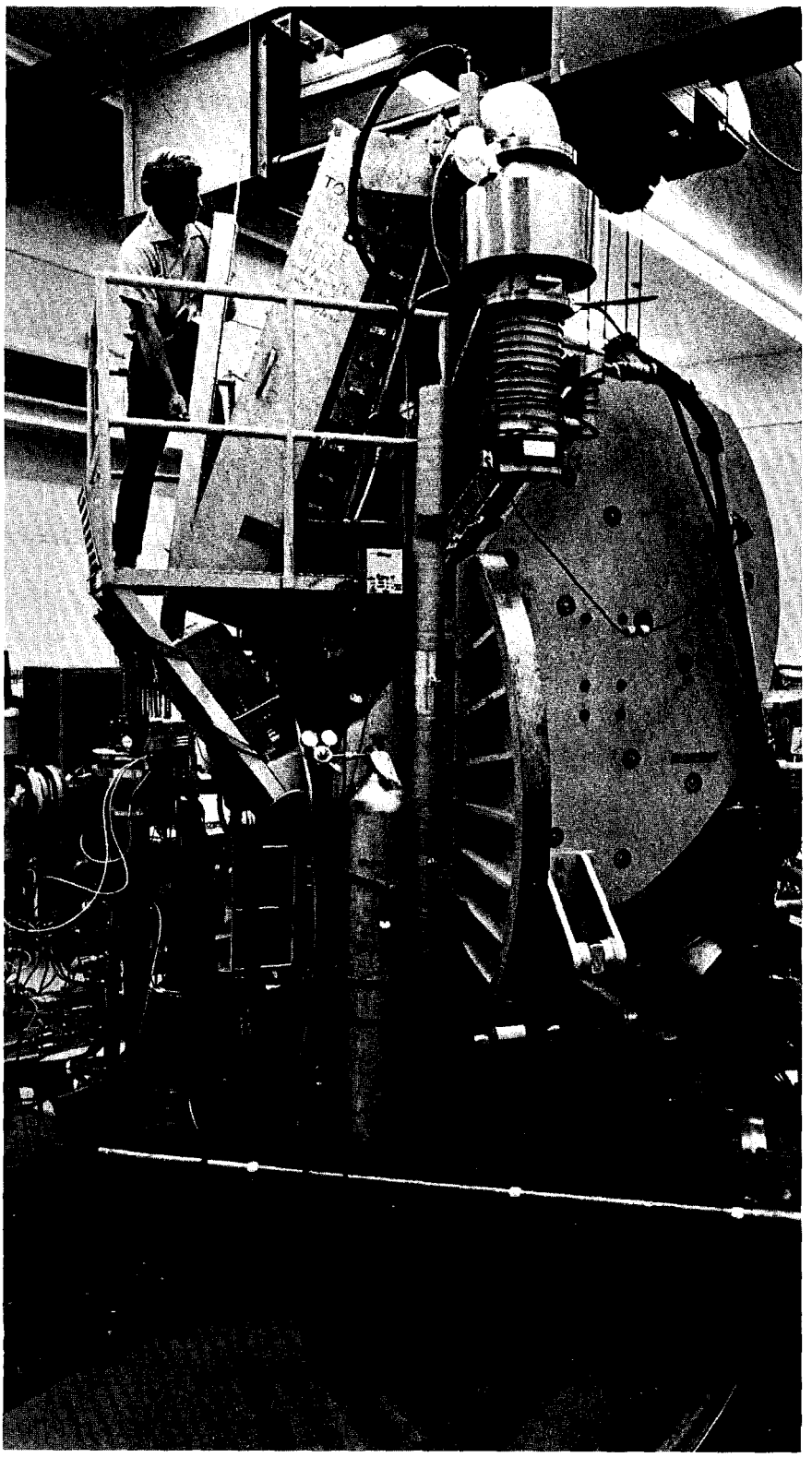
At the Los Alamos Scientific Laboratory, Group P-10 is using a newly-developed automatic plate scanner that can process these so-called nuclear track plates incredibly faster than a human and with a relatively high degree of accuracy. Wallace Leland, P-10 group leader, in drawing a comparison between manual (human) and machine scanning, noted that a typical 10-inch track plate that might take a human 20 to 40 hours to read, can be scanned by the new machine in 15 minutes. "With manual scanning we are able to discern virtually 100 per cent of the legitimate tracks." Leland said. "With machine scanning we typically find anywhere from 50 to 100 per cent of the tracks depending on the condition of the plate and other variables. We are still improving the machine and feel it is only a question of time and experience until we learn how to assess and control these variables to a point where we can confidently use the results of the machine scan without backup work by manual scanning."

Group P-10 offers plate reading service at the Laboratory in connection with nuclear reaction studies. "We're interested in how many particles of what energies are recorded on a track plate," the group leader said. "Both parameters relate back to some property of the nucleus. The energy parameter is an indication of the energy level of the nucleus and the number of particles relates back to the cross section, or probability of a specific interaction taking place."

Plate exposures are made at the accelerator facilities at LASL, and elsewhere on occasion, for particle interaction investigations in the low and intermediate energy regions, although the group's work is most closely linked with the Laboratory's Tandem Van de Graaff acccelerator.

At the Tandem Van de Graaff, a spectrograph is situated to accept particles thrown out from targets in the accelerator beam. The spectrograph fans out the particles into an energy spectrum and they impinge on a photographic plate. When a particle strikes the plate,

continued on next page



Stuart Orbesen, P-DOR, loads a photographic plate holder in the Tandem Van de Graaff spectrograph. The holder can contain about six feet of nuclear track plates.

it leaves a track that appears in the developed emulsion as a series of closely spaced silver grains about 40 micro-inches (.000040 of an inch) in diameter along the particle trajectory.

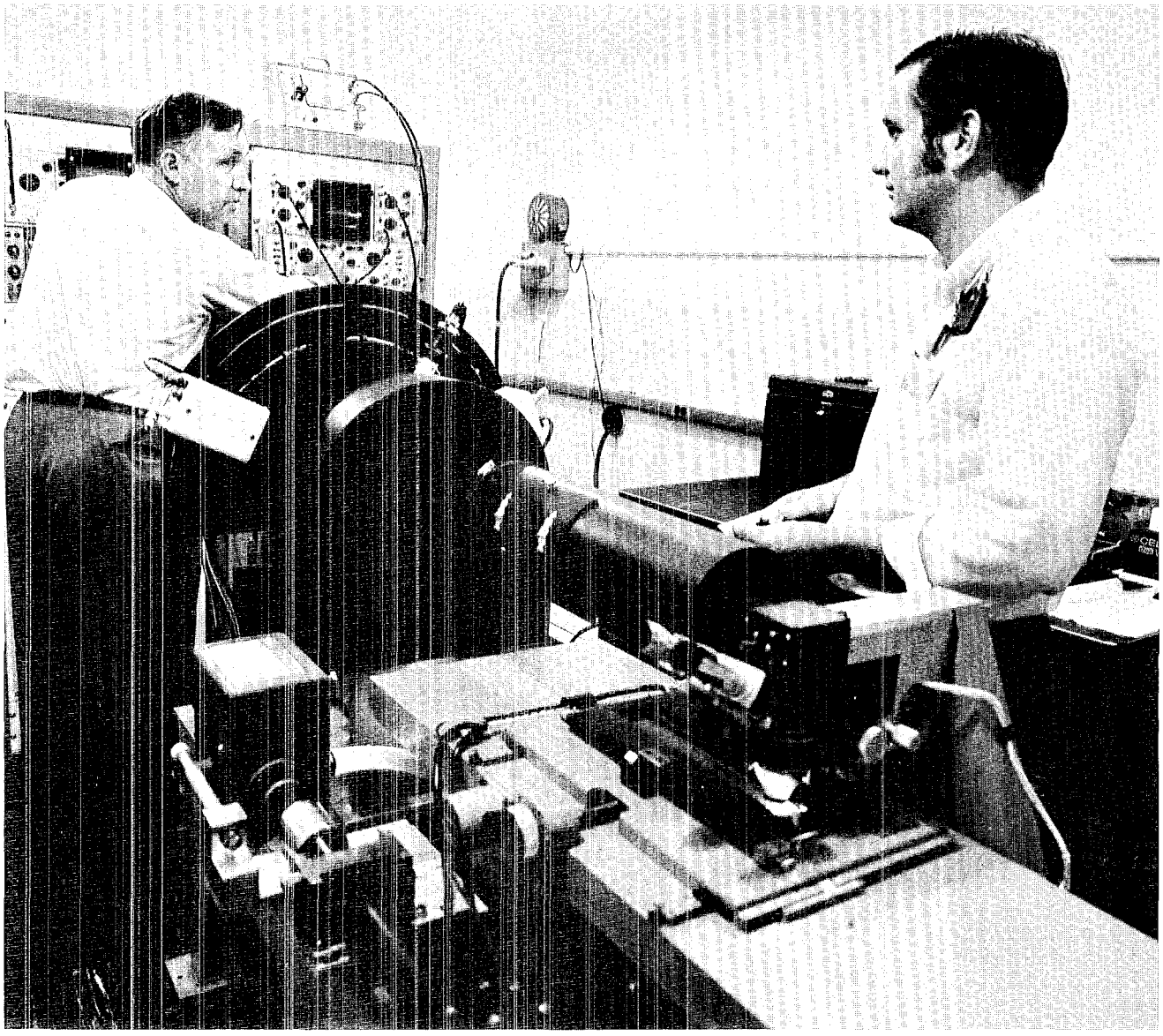
The problem in developing a machine that can track particles as well as the human has to do with pattern recognition. The machine is able to recognize only those events for which it has been programmed, whereas the human can detect slight variations and unexpected features.

A scanning machine to supplement manual plate reading was included in the planning for experimental facilities at the Tandem Van de Graaff in the early 1950's. Leland and John Winston, P-1, visited the Massachusetts Institute of Technology where scientists had developed an automated plate scanner and had demonstrated that it could read a track. "We borrowed their design and Winston constructed one here with modifications," Leland said. "It functioned after a fashion, but it didn't achieve the degree of performance we had hoped for.

"Argonne National Laboratory was also building one, but they used a computer in association with theirs. With our experience on the first model, we pooled what we felt were the best ideas of the two machines and came up with the one we now have."

Designing and building the new machine took more than two years. Ed Flynn, P-DOR was largely responsible for its development. He was given assistance by several other people in other groups. Stuart Orbesen, P-DOR, did much of the mechanical work; Dick Hebert, P-1, provided some of the electronics. Tom Gardiner, C-8, came up with the computer/scanner interface to digitize electrical signals and transmit them to the on-line computer. Max Seamons, C-4, provided the computer program. Bill Bentley, P-10, now operates and maintains the machine for routine analyses of nuclear track plates.

On the main stage of the machine

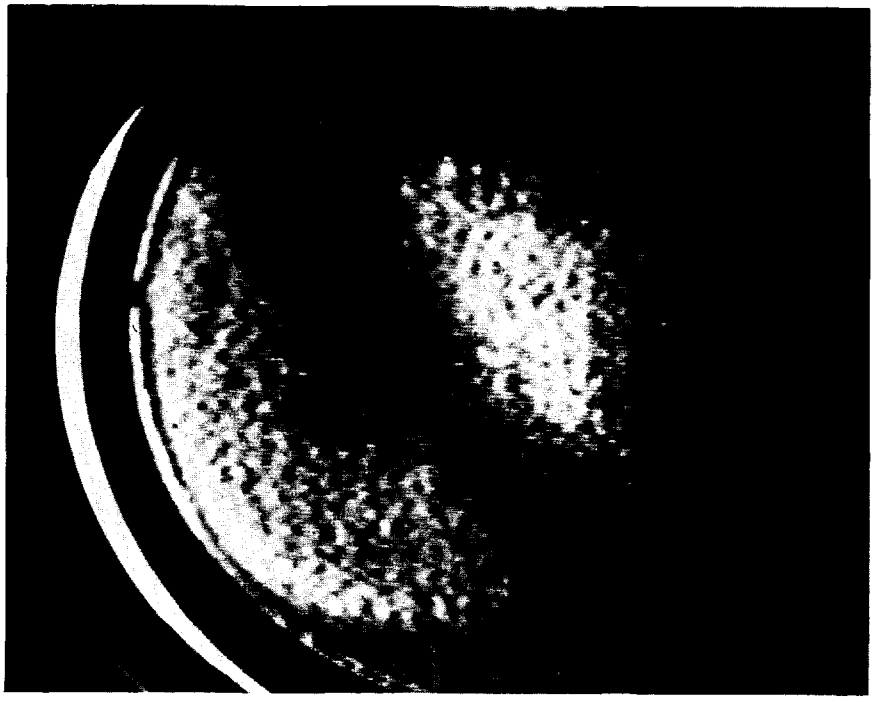


Wallace Leland, P-10 group leader, and Bill Bentley, also of P-10, operate the automatic plate scanner.

is a holder in which the nuclear track plate is placed. Light from two mercury lamps is focused and shaped into a narrow slit which illuminates a portion of the plate from below. This light passes through the plate and is scattered by developed silver grains. An optical system uses this scattered light to form a magnified image of the developed grains on a scanning plane. Located on the scanning plane is a three-mil (.003 of an inch) slit which permits a selected "line" of the image to pass through and fall on a glass disc whose surface is opaque with the exception of a transparent groove which spirals from the center of the disc to its edge. The disc rotates so that the spiral groove essentially scans across the slit in the housing and allows the imaged light to pass through to a photomultiplier tube. Signals from the tube and the disc position indicator are transmitted by the interface unit to the on-line computer. There is a short "dead space" before the spiral crosses the slit again, and during this period the track is moved lengthwise a distance of five microns (.0002 of an inch) by a lead screw which drives the plate holder. The process is repeated until the whole plate is scanned.

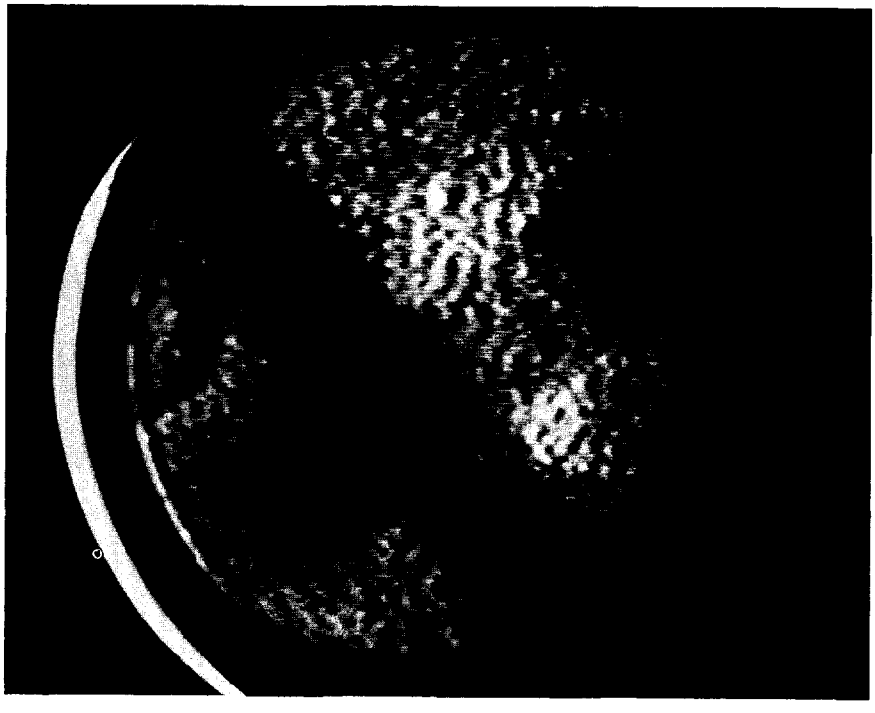
The operator of the automatic scanning machine transmits instructions to the computer through a teletype terminal. The computer is programmed with several adjustable parameters which can be selected by the operator to meet specific plate reading requirements. Computer output is on paper tape, a plotter and magnetic tape.

Resonance



A cross composed of strips of indium and gold was radiographed using the resonance neutron approach. The television camera tube was gated at the 1.45 eV resonance of indium. At this resonance the indium (dark shadow) was imaged, but the gold was not.

A cross composed of a strip of indium and a strip of hafnium resulted in an image of both. The reason is that absorption characteristics of the two elements are similar for the resonance region selected.



A new radiographic technique that can be used to identify specific elements while in the presence of others has been developed at the Los Alamos Scientific Laboratory. Its development was a joint effort of Groups J-16 and GMX-1. Its employment will greatly supplement other radiographic techniques used by GMX-1 in the nondestructive evaluation of materials for various research and development programs.

Radiography is the process of making a picture through the use of radiation other than normal light. One of its most common uses is in the medical field where x rays are employed to photograph organs of the body. The picture, a shadow image of the variations in transparency of the subject to x radiation, is called a radiograph. Other types of radiation used to image objects are gamma rays and thermal neutrons.

Radiographs produced by established techniques provide overall internal views of materials. They are used by GMX-1 to disclose cracks, fractures, gas pockets, inclusions and other internal structural details. Potential applications of the newly-developed method include investigations of the distribution of specific elements and isotopes in agglomerates and composite materials, and the inspection of individual layers in laminated structures. In its present state, however, resolution is somewhat inferior to radiographs made with better established techniques.

With the new method, radiographs are obtained of elements in components and materials using resonance neutrons. Resonance is the phenomenon whereby particles such as neutrons, at specific kinetic energies, exhibit a very high interac-

Neutron Radiology: A New Technique

tion probability (cross section) with nuclei of the elements. Cross sections for neutron interactions exhibit peaks at one or more of these so-called resonance energies of neutrons which are as unique to particular elements as fingerprints are to members of the human race. Cross sections between peaks are relatively low.

The resonance approach to obtaining neutron radiographs capitalizes on the adaptation of a unique television camera tube which was developed originally for use in weapons diagnostics. Before atmospheric testing was banned, rocket borne diagnostics to determine the behavior of explosive systems were dependent upon telemetry equipment which was often times not fast enough to reproduce the short-time history of the event.

The Rauland Company, which was working on image intensifying equipment for the military, was contracted to work with J-16 on the development of a diagnostic instrument that would operate rapidly and provide a visual image. The instrument developed was a television camera tube that can be gated (turned on and off) rapidly, mated with an image intensifier to increase the sensitivity of the tube and therefore permit short exposure times. The tube can be gated for exposures as fast as 20-billionths of a second.

Clarence Benton was instrumental in coordinating J-16's interests with the company, and along with Lee Sprouse, developed the electronics necessary for operating the tube. Sprouse built experimental setups in which initial tube designs were tested by Benton and Leon Forman.

About two years ago, John Yarnell, P-2 group leader, and Donald Garrett, GMX-1 Research section leader, and co-worker Roger Morris considered a radiographic technique in which the resonance regions of elements would be used for self-identification if a gated image tube and a pulsed neutron source of sufficient strength were available. The television camera tube developed by J-16 and the Rauland Company met GMX-1 requirements.

In experiments conducted by J-16 under the direction of Leon Forman, the feasibility of using the tube for neutron resonance radiography was demonstrated. A pulse of neutrons generated from a burst reactor was collimated into a beam and directed at selected target materials. Upon reaching the target, some of the neutrons passed through while others were absorbed or scattered. Those that passed through interacted with a lithium-6 loaded glass fluor and were converted to visible light. This light was reflected by a mirror at an angle of 45 degrees into a lens focused onto the television camera tube. The tube was emplaced at a right angle to the neutron beam and shielded so other radiations would not affect the radiograph image.

The tube was gated at the instant in time when neutrons whose energies were in agreement with the resonance of the element being evaluated, were being absorbed by the target. The radiograph then, showed a shaped shadow image of a specific element surrounded by a light area.

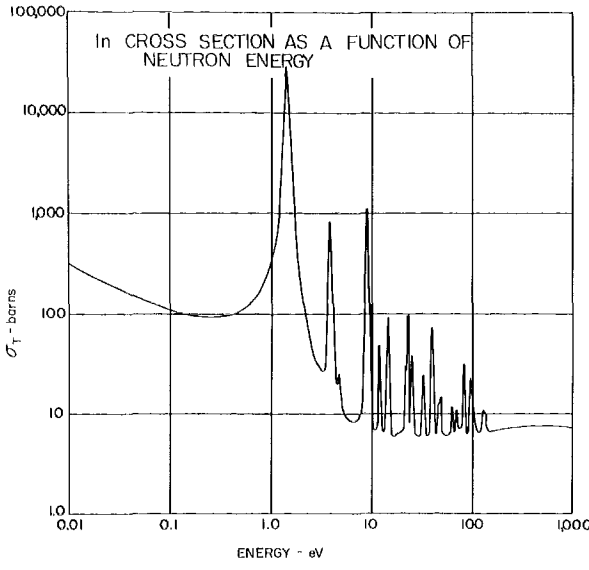
Proper timing was accomplished by placing a fluor-photocell detector, built by J-16's Art Schelberg, beside the target. When gamma rays and faster neutrons contacted the detector, an electronic circuit was triggered. After a calculated time delay, relevant to the time-of-flight of neutrons of desired energy, an amplified electrical pulse gated the camera tube.

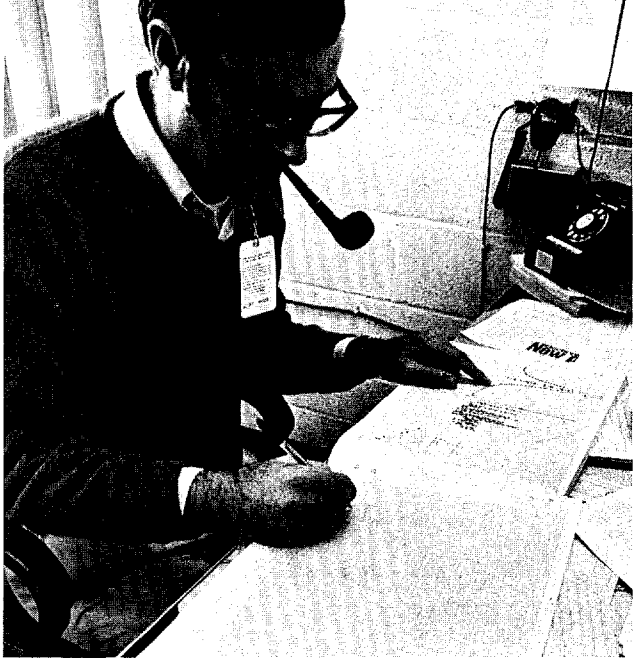
Neutrons vary in energy (velocity). They are classified as being either fast, intermediate or thermal (slow). Since neutrons of various energies are released with each pulse, their time-of-flight to the target and fluor-photocell detector varies accordingly. Targets were placed about 13 meters from the beam port of the Sandia Pulsed Reactor so that neutron energies were well defined in time.

To establish feasibility, a variety of targets was used in these experiments. One consisted of a strip of indium and a strip of gold. The Los Alamos researchers made an "X" with the two strips and then shuttered the camera tube to accept

continued on page 17

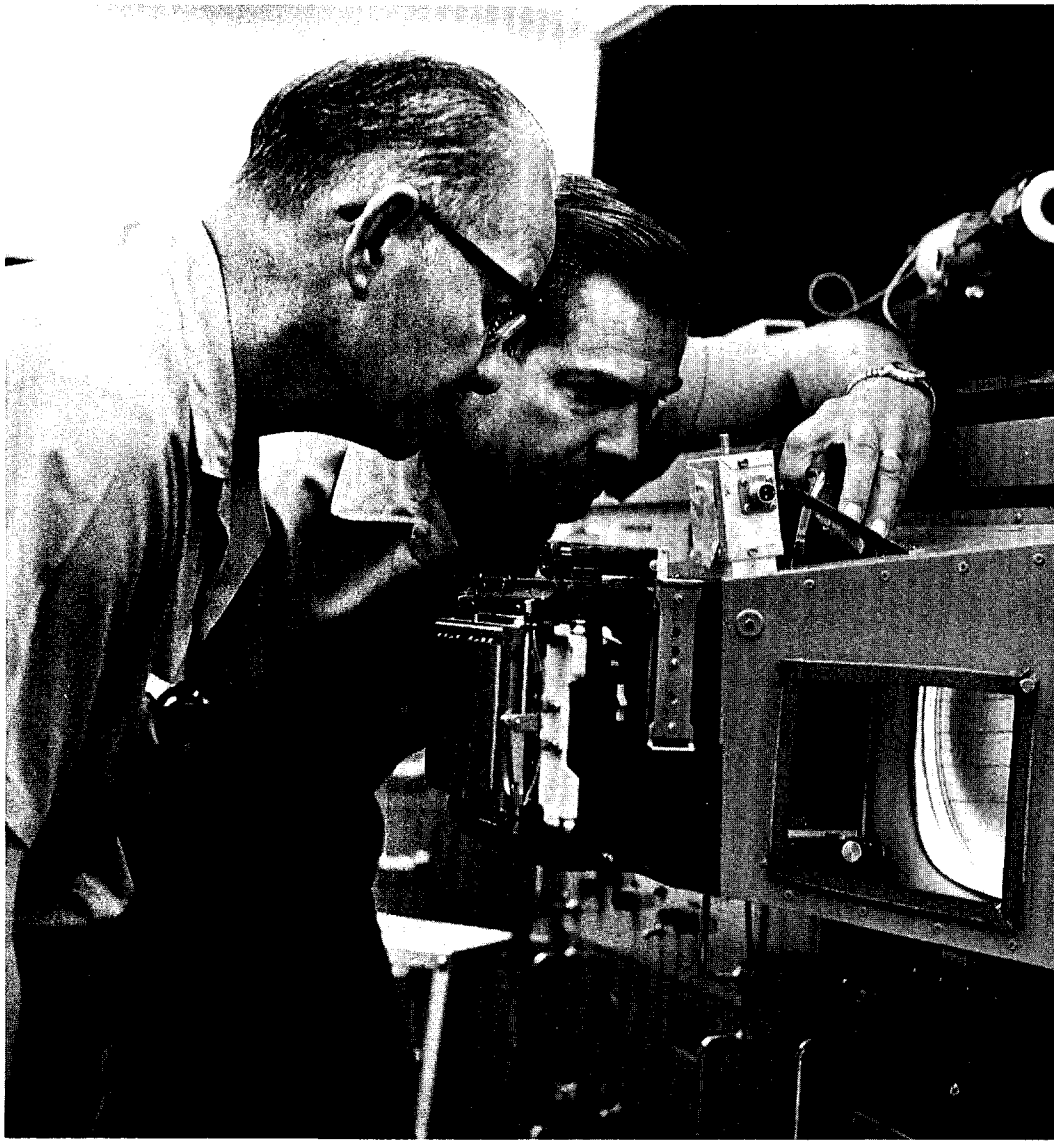
The resonance peaks of indium are shown on this illustration.



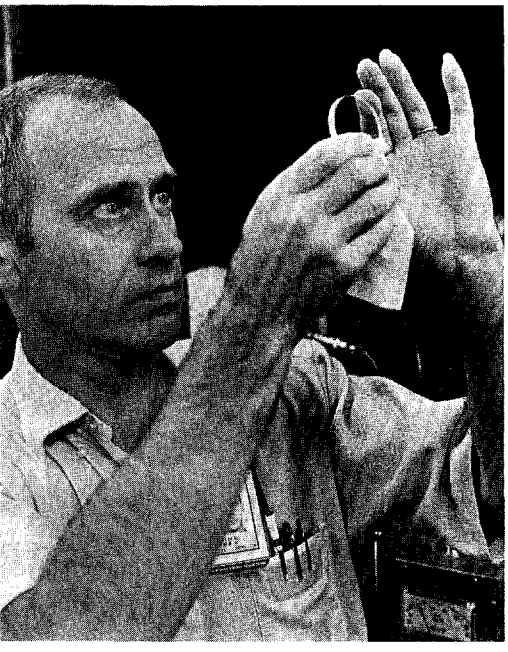


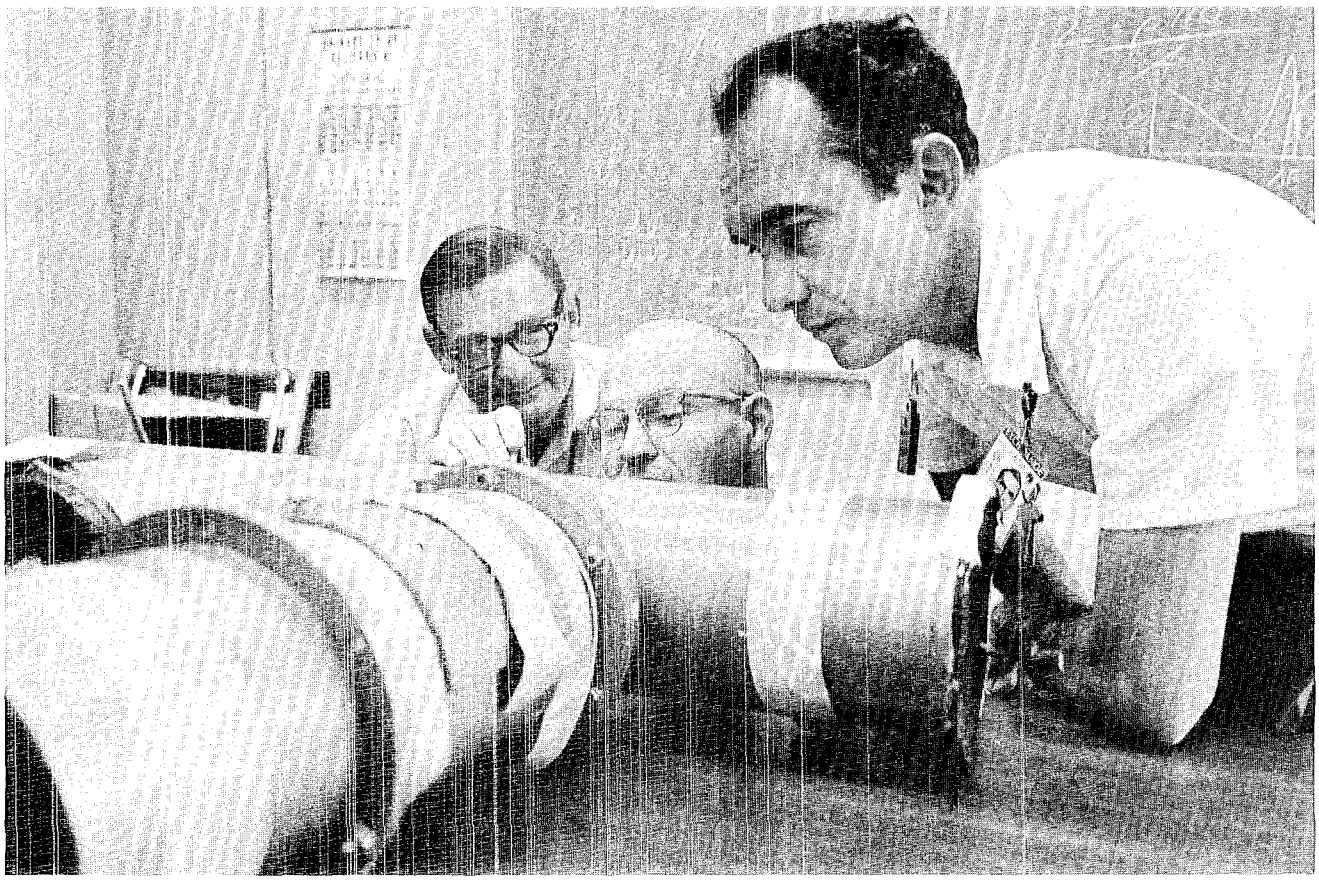
Left, Leon Forman, J-16, directed experiments to prove the feasibility of using the television camera tube in resonance neutron radiography.

Below, Clarence Benton and Lee Sprouse, both of J-16, adjust the monitor on the hardware used in experiments to develop the resonance neutron radiographic technique. At upper right is the television camera tube developed by J-16 and the Rauland Company.



Art Schelberg, J-16, cleans the lithium-6 loaded glass fluor he built for the radiography experiments.





Inspecting the camera tube housing used in the resonance neutron radiography experiments are Don Garrett, GMX-1 Research section leader, and Bob Showalter and Roger Morris, both of GMX-1.

an image about the 1.45 electron-volt (eV) resonance of indium. The probability of neutrons of this energy being absorbed by the gold is quite low compared to indium. The 1.45 eV neutrons passed through the gold and were converted to visible light by the fluor, but they were absorbed by indium, resulting in a shadow image of indium on the radiograph.

In another experiment strips of indium and hafnium were crossed. Both strips were imaged because absorption characteristics of the two elements are similar for the resonance region selected. Other radiographs were made with distinct images at the 4.9 eV resonance of gold, the 1.1 and 2.38 eV resonances of hafnium, and the 0.45 eV resonance of erbium.

The first experiments were attempted using the Los Alamos reactor, Godiva. Of necessity, the camera tube had to be set up within the target building containing Godiva. Although it was demonstrated that the tube could be operated in the radiation environment, no radiographs could be obtained. One of the reasons was the very high level background of gamma rays and neutrons scattering throughout the kiva following the reactor burst.

The main attraction of the Sandia Laboratories' Pulsed Reactor Facility was the collimator port through the five-foot thick concrete kiva wall surrounding the reactor. This allowed the experiment to be set up in a lower background region outside the structure housing the reactor while utilizing the moderated beam of neutrons emerging from the collimator port. Some localized shielding, designed by Schelberg, was still necessary to protect the camera tube and fluor from parts of the main beam.

Further development and practical applications of the technique at Los Alamos are largely dependent on acquiring an appropriate pulsed-neutron source. Resonance neutron radiography by GMX-1 is included as one justification for pulsed-neutron facilities proposed by P and W divisions.

Director Harold M. Agnew Announces Several Changes in Staff at Laboratory

Several staff changes at the Los Alamos Scientific Laboratory have been announced in the past few months by Harold M. Agnew, director. These include:

Raemer Schreiber, technical associate director, has assumed the Director's Office responsibility for the Engineering and Shop Departments. Upon the retirement of Henry R. Hoyt on October 31, the position of assistant director for administration will be eliminated and all organizations now reporting to Hoyt will report to Schreiber.

Duncan P. MacDougall has been named to the new position of assistant director for weapons with Eugene Eyster replacing him as GMX division leader. William E. Deal Jr. is now alternate division leader of GMX with Melvin Brooks associate division leader. Jesse Aragon succeeds Brooks as group leader of GMX-3.

In addition to being CMB division leader, Richard Baker is now acting division leader of CMF division, replacing Robert Fowler. Fowler has been assigned to the Director's office as a research advisor.

Robert Shreffler succeeds Agnew as W division leader and Don H. Byers has become alternate W division leader with Harry C. Hoyt and B. L. Moore as associate W division leaders.

"A" Division Formed Under Leadership of David Hall

David B. Hall

A new division, the Assay and Accountability division, has been formed with David B. Hall as leader. Hall points out that actually the new division is a functional centralization. A division is staffed by, and will perform services formerly done by three unrelated groups: N-6, W-7 and ADPSF.

G. Robert Keepin is group leader for A-1 with Roddy B. Walton as his assistant. The function of the 25 members of A-1 will be the same, basically, as that done when Keepin's group was N-6, namely research into, and application of, the newest techniques of fissionable materials assay.

A-2, under the direction of its group leader William H. Chambers, will do the same type of work done in A-1 except its field of interest will be applications of assay techniques to weapons and other classified defense areas. This group of 12 is made up of personnel from W-7 and N-6.

The accountability portion of the work to be done by A division will be handed by the nine members of A-3. A-3, with Glenn R. Champion as group leader and Victor Bond as alternate, used to be designated ADPSF.

While the new division is not actually "new", in the sense of all new personnel or functions, Hall says that the creation of a specific division unifying the formerly separated functions will enable expansion of their capabilities and will simplify their use within and without the Laboratory. Hall hopes that, in addition to constantly improving the speed and accuracy of the assay and accountability functions, the division can enter fields in which it is only peripherally active now such as offering assistance in evaluating fuel burn-up in nuclear power reactors, fuel management in fuel processing plants, and evaluation of fuel cycling.

short subjects

Group CMF-9 has been transferred to P division as group P-8. **Edward F. Hammel** and **Adam F. Schuch** have asked to be relieved of their respective administrative responsibilities as group leader and alternate group leader in order to pursue their research interests. **William E. Keller** has been appointed group leader.

Degrees granted by the Los Alamos Graduate Center in June numbered 15. This brought the total number of degrees granted by the center to 172.

The recipients included nine Laboratory employees. **Ronald Boyd,** ENG-7 received the M. S. degree in mechanical engineering; **Jerry Beatty,** J-7, M. S. in nuclear engineering; **Bruce Coplen,** MP-3, M. S. in physics; **Jack Hardwick,** MP-2, M. S. in electrical engineering; **Andrew Kozubal,** W-1, M. S. in electrical engineering; **Murlin Nutter,** J-18, M. S. in nuclear engineering; **Charles Tallman,** N-4, M. S. in engineering science of materials; **William Turner,** N-3, M. S. in engineering science of materials; and **Frederick Van Haaften,** GMX-11, M. S. in electrical engineering.

Four former LASL employees were also granted degrees. Two of these attended classes under the Atomic Energy Commission's Technical Scholarship Program. They were **W. Maxwell Mathieson,** formerly of GMX-3, and **Peter Olivas,** formerly of GMX-8, both of whom received the B. S. degree in electrical engineering. **James Cramer,** formerly of W-8, and **Billy Moore,** formerly of K division, were granted the Ph. D. degree in physics and nuclear engineering respectively.

Other degree recipients were **Ted Lucas** of Control Data Corporation who is assigned at the Laboratory, and **Lewis Moore** of Aerojet-General who is serving with Group N-7 as a visiting research assistant. Lucas received the M. A. in mathematics, and Moore, the M. S. in mechanical engineering.

Vernon L. Stewart, SD-5 machinist, has retired after 19 years with the LASL Shop department. He will make his home in Milwood, Ill.

Edward Maestas, GMX-3 chemical plant operator, second class, died July 11 as the result of injuries received in an automobile accident. He had been employed by GMX-3 since 1949. He is survived by his wife, Lola, and nine children, Oliver, Silviano, Rudolpho, Lorraine, Ameda, Lucinda, Pauline, Maria Elena and Eva.

Stanley Daily, N-1 senior physics metallurgy technician, died July 22. He was first employed by the Laboratory in 1956 with Group J-11. He transferred to CMF-13 and then to N-1. He is survived by his wife, Dorothy, and three daughters, Martha Jane Refuss, Cynthia Marie Prewitt and La Donna Daily.

Celestino M. Trujillo, GMX-3, died Aug. 3 following a long illness. He had been employed by the Laboratory since 1952, first by the Mail and Records department and later by GMX-3 as a special messenger driver. Trujillo is survived by his wife, Anita, and two children, Santa Ida and Andres.

Jack W. Alexander, J-14 electronics technician II, died Aug. 16. He had been an employee of J division since 1956. Alexander is survived by his wife, Billie, and three children, Jack, Jr., Carolyn Sloan and Sally Alexander.

Richard M. Alire, W-7, has been elected a Fellow of the American Institute of Chemists. The 7,400-member institute is the only chemically-oriented American organization whose principal purpose is to develop the professional and economic status of chemists and chemical engineers.

For Reporting Change of Address

If your address has changed please inform THE ATOM by clipping and filling out this coupon. Print or type your name and both your old and new addresses.
Mail to: The Atom
Los Alamos Scientific Laboratory
Box 1663
Los Alamos, N.M. 87544

Previous Address

name

address

city state zip code

New Address

address

city state zip code

the technical side

Presentation at meeting of the Industrial Photographers of the Southwest, Albuquerque, May 15:

"Color Movies from Computers" by D. O. Dickman, C-4

Presentation at the 11th Annual Meeting of the Institute of Nuclear Materials Management, Gatlinburg, Tenn., May 25-27:

"Neutron Interrogation Techniques for Fissionable Material Assay" by H. O. Menlove, R. H. Augustson, L. V. East, A. E. Evans, and G. R. Keepin, all N-6

"The Los Alamos Mobile Nondestructive Assay Laboratory (MONAL)" by J. H. Menzel, B. R. Dennis, M. M. Thorpe, R. B. Walton, D. B. Smith and G. R. Keepin, all N-6

Presentation at Symposium on Newer Techniques and Technology in Radiotherapy and Oncology, University of Southern California School of Medicine, Los Angeles, June 5-6:

"Radiation Therapy with Negative Pions" by R. L. Hutson, MP-7 (invited)

Presentation at Gordon Research Conference on Nuclear Chemistry, New London, N.H., June 14-19:

"A New Calculation of Single Particle Effects on the Fission Barrier" by J. R. Nix, T-9 (invited)

Presentation at Applied Superconductivity Conference, University of Colorado, Boulder, June 15-17:

"A New Calculation of Single Particle Effects on the Fission Barrier" by J. R. Nix, T-9 (invited)

"Superconducting Quadrupole Doublet for LAMPF" by J. D. Rodgers and H. L. Laquer, both CMF-9, W. V. Hassenzahl, MP-6, and J. K. Novak, MP-7

"A Constant Voltage Controller and a Transition Monitor for Superconducting Magnets" by D. H. Lester, CMF-9

Presentation at Second International Conference on Nuclear Data for Reactors, Helsinki, Finland, June 15-19:

"Calculations of Jezebel and Godiva with Recent ENDF/B Microscopic Data" by G. H. Best, M. E. Battat, R. J. LaBauve, and R. E. Seamon, all T-1

"Fission and Capture Cross Sections of Curium" by M. S. Moore, W. K. Brown, G. A. Keyworth, all P-3, M. E. Ennis and R. R. Fullwood, both W-8, J. H. McNally, W-4, F. B. Simpson and J. R. Berreth, both Idaho Nuclear Corporation, R. D. Baybarz, Oak Ridge National Laboratory, and M. C. Thompson, Savannah River Laboratory

"A Simultaneous Measurement of the Fission, Capture, Scattering and Total Cross Sections of ^{239}Pu" by J. A. Farrell and P. A. Seeger, both W-8, and G. F. Auchampaugh and M. S. Moore, both P-3

Presentation at Gordon Research Conference on Research at High Pressures, Holderness School, Plymouth, N.H., June 16:

"Calculations of Effects of Pressure on Band Structures and Fermi Surfaces: Correlation with Compressibility" by E. A. Kmetko, CMF-5 (invited)

Presentation at the University of Indiana, Bloomington, June 16:

"The Los Alamos Lamb-Shift Source of Polarized Negative Ions and Experience at 7-16 MeV with Deuteron and Proton Reactions" by J. L. McKibben, P-9

Presentation at 17th Refractory Composites Working Group Meeting, Williamsburg, Va., June 16-18:

"Graphite Research and Development at LASL" by M. C. Smith, CMF-13

Presentation at the 1970 Transformation Meeting, Estes Park, Colo., June 16-19:

"Competence-Specific Antigens of **Haemophilus Influenzae** for Uptake of Transforming DNA" by D. P. Bingham and B. J. Barnhart, both H-4

Presentation at the Fourth Summer Institute for Astronomy and Astrophysics, State University of New York, Stony Brook, June 17-July 15:

"Physical Processes in the Outer Solar Atmosphere" by A. J. Hundhausen, T-12 (invited)

"Quantitative Model of the Coronal Expansion" by A. J. Hundhausen, T-12 (invited)

"Coronal and Interplanetary Chemical Composition" by A. J. Hundhausen, T-12 (invited)

Presentation at the Cryogenic Engineering Conference, Boulder, Colo., June 17-19:

"Cryogenics—Safety and Society" by R. Reider, H-3

"Heat Transfer with the Helium II Superfluid Film" by D. H. Liebenberg, CMF-9

Presentation at the University of Pittsburgh, Pa., June 18:

"The Los Alamos Lamb-Shift Source of Polarized Negative Ions and Experience at 7-16 MeV with Deuteron and Proton Reactions" by J. L. McKibben, P-9

Presentation at the Fourth Great Lakes Regional Meeting of the American Chemical Society, North Dakota State University, Fargo, June 18-19:

"RNA's of Cultured Chinese Hamster Cell Post-Ribosomal Particulates" by M. D. Enger, R. A. Walters and A. G. Saponara, all H-4

Presentation at Symposium of Feedback and Dynamic Control of Plasmas, Princeton, N. J., June 18-19.

"Feedback Stabilization of a High-Beta, Sharp-Boundaried Plasma Column with Helical Fields" by F. L. Ribe, P-15, and M. N. Rosenbluth, Institute for Advance Study, Princeton, N. J.

"Dynamic Stabilization of the Z-Pinch" by J. A. Phillips, P. R. Forman, A. Haberstich and H. J. Karr, all P-14 (invited)

Presentation at the Northwest Regional Meeting of the American Chemical Society, Seattle, Wash., June 18-19:

"Classical Trajectories of Simple Reacting Systems" by N. C. Blais, CMF-4 (invited)

Presentation at Seminar on Plasma Focus, University of Wisconsin, Madison, June 19:

"Plasma Focus" by J. W. Mather, P-7

Presentation at a joint seminar, University of Houston and Rice University, Houston, Texas, June 19:

"On the Discrepancy Between Soft Pion Predictions and Experiment in Pion Production in Nucleon-Nucleon Collisions" by R. R. Silbar, T-9, and M. E. Schillaci, MP-7

Presentation at the Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24:

"Mercury as a Heat Pipe Fluid" by J. E. Deverall, N-5 (invited)

Presentation at the Annual Congress of the Canadian Association of Physicists Joint Meeting with the American Physical Society and the Mexican Society of Physics, Winnipeg, Manitoba, Canada, June 22-24:

"Status of Plasma Focus" by J. W. Mather, P-7 (invited)

"Barrier Penetrability Modification by Vacuum Polarization" by J. E. Brolley, P-DOR, and D. A. Liberman, T-4

Presentation at the 44th National Colloid Symposium, Lehigh University, Bethlehem, Pa., June 22-24:

"Characterization of Anomalous Water by Physical Methods" by S. W. Rabideau and A. E. Florin, both CMF-2

Presentation at the American Institute of Aeronautics and Astronautics Sixth Propulsion Joint Specialist Conference, San Diego, Calif., June 22-26:

"Operational Techniques Used in Liquid Hydrogen Pump Inducer Studies" by J. Connell and J. Henshall, both formerly J-17, and W. Tucker, N-4

Presentation at seminar at University of Oregon, Eugene, June 25:

"Nucleon Physics Laboratory at LAMPF" by J. C. Hopkins, P-DOR (invited)

Presentation at seminar, Argonne National Laboratory, Ill., June 25:

"Detection of Multiple Impurities in Sodium With a Plugging Indicator" by J. C. Biery, formerly K-3

Presentation at the 16th Annual Meeting, American Nuclear Society, Los Angeles, Calif., June 28-July 2:

"Reactor Fuel-Cycle Analysis at Los Alamos Scientific Laboratory" by T. J. Hirons, W-4

"Fuel Forms for Plutonium-238 Power Sources" by J. A. Leary, CMB-11 (invited)

"Nuclear Cross Sections—Multigroup Representation of Neutron Cross Sections for Criticality Calculations" by G. E. Hansen, N-2 (invited)

"Computer Simulation of Fluid Flows Using Eulerian Difference Methods" by R. A. Gentry, T-3 (invited)

"Neutron Transport Experiments with Bare Metal Spherical Systems" by R. R. Fullwood, W-8 (invited)

"Neutron Cross Sections for Air Transport" by P. G. Young and D. G. Foster, Jr., both P-3 (invited)

"Calculated Neutron Environment for Phoebus 2A" by C. W. Watson, N-2

"The S_n Method" by K. D. Lathrop, T-1 (invited)

"Truncation Error Analysis of Finite Difference Approximations to the Transport Equation" by W. H. Reed and K. D. Lathrop, both T-1

"Heterogeneity Effects on Large Fast Breeder Fuel-Cycle Calculations" by T. J. Hirons, W-4, and R. E. Alcouffe, T-1

Presentation at the annual meeting of the Health Physics Society, Chicago, Ill., June 28-July 2:

"External Measurement of Plutonium Lung Burdens" by P. N. Dean, H-4, and H. M. Ide, H-5

"Retention of Subcutaneously Placed PuO_2 in the Beagle" by L. J. Johnson, H-1, R. L. Watters, Colorado State University, Fort Collins, Colo., C. R. Lagerquist and S. E. Hammond, Rocky Flats Division, Dow Chemical Company, Boulder, Colo.

"Neutron Measurement Using Thermoluminescent Dosimeters" by M. J. Engelke, H-1

"Radiation-Safety Instrumentation for a High Intensity, High Duty Accelerator" by J. R. Parker, MP-1 (invited)

"Personnel Protection and Contamination Control During Mining Operations in Highly Plutonium Contaminated Earth" by R. W. Henderson, H-8

"The Current Status of Personnel Neutron Dosimetry" by D. E. Hankins, H-1 and C. M. Unruh, Battelle-Northwest, Richland, Wash.

"Plutonium Excretion and Modeling of Excretion Patterns to Estimate Plutonium Body Burdens" by W. D. Moss, H-5, and G. L. Tietjen, C-5

"The Safe Handling of Large Quantities of Tritium Gas at the Los Alamos Tandem Accelerator Facility" by T. P. Seitz, R. Woods, M. Wallis and R. L. Henkel, all P-9

"Door Alarm and Interlock System at the Los Alamos Tandem Accelerator Facility" by T. P. Seitz, H. J. Lang, and R. L. Henkel, all P-9

Presentation at the Fourth International Congress of Radiation Research, Symposium on Radiation Responses and the Cell Cycle, Evian, France, June 28-July 4:

"Biochemical Events During the Mammalian Cell Cycle" by D. F. Petersen, E. C. Anderson and R. A. Tobey, all H-4 (invited)

"Repair and Residual Injury in Monkeys Exposed to Fractionated Doses of Gamma Rays" by J. F. Spalding, L. M. Holland and J. R. Prine, all H-4

Presentation at the American Institute of Aeronautics and Astronautics Third Fluid and Plasma Dynamics Conference, Los Angeles, Calif., June 29-July 1:

"Recent Progress in Controlled Thermonuclear Fusion Research" by J. L. Tuck, P-DO (invited)

Presentation at seminar at the University of Oregon, Eugene, July 1 and at Lawrence Radiation Laboratory, Berkeley, Calif., July 6:

"On the Discrepancy Between Soft Pion Predictions and Experiment in Pion Production in Nucleon-Nucleon Collisions" by R. R. Silbar, T-9 and M. E. Schillaci, MP-7

Presentation at Symposium on Progress in Safeguards Techniques,

continued on next page

Karlsruhe, Federal Republic of Germany, July 6-10:

"Application Areas and results of Nondestructive Assay Measurements" by G. R. Keepin, H. O. Menlove, M. M. Thorpe, R. H. Augustson, C. N. Henry, D. B. Smith, and T. D. Reilly, all N-6

"Development of Techniques for Active and Passive Assay of Fissionable Materials" by R. H. Augustson, H. O. Menlove, R. B. Walton, L. V. East, A. E. Evans and M. S. Krick, all N-6

"A Mobile Laboratory for Nuclear Safeguards" by J. H. Menzel, M. M. Thorpe, R. B. Walton, D. B. Smith, G. R. Keepin, all N-6, and B. R. Dennis, ENG-6

Presentation at the International Symposium on Applications of Holography, Besancon, France, July 6-11:

"Holographic Interferometry of Transient Plasmas" by F. C. Jahoda, R. E. Siemon and K. S. Thomas, all P-15

Presentation at the Scintillator Conference, San Francisco, Calif., July 7-10:

"The Photo-Oxidation of 2, 5-Diphenyloxazole (PPO)" by Margaret E. Ackerman and G. H. Daub, both Chemistry Department University of New Mexico, and F. N. Hayes, H-4

"A Stereochemical Approach to Self Quenching Studies in Some Bridged **p**-Quaterphenyl Systems" by T. W. Whaley and G. H. Daub, both Chemistry Department, University of New Mexico, and F. N. Hayes, H-4

"Lifetime, Fluorescence Efficiency, and Scintillation Studies on Some **trans**-1, 2-Diarylethylenes" by R. B. Lehmann and G. H. Daub, both Chemistry Department, University of New Mexico, F. N. Hayes, H-4, and J. Yguerabide, Sandia Corporation, Albuquerque

Presentation at Colloquium on the Theory of Atomic Structure, Paris, France, July 8-11:

"Cancellation Effects in Computed Atomic Transition Probabilities" by R. D. Cowan, T-DOT

Presentation at the National Science Foundation College Teachers Research Participation Program, University of Arkansas, Fayetteville, July 10:

"ESR and X-ray Studies of the Bonding in Metal Cluster Compounds" by C. E. Strouse, CMF-4 (invited)

Presentation at International Powder Metallurgy Conference, New York City, July 12-16:

"Contributions to the Practical Application of Powder Characterization Data" by R. E. Riley, CMB-6

Presentation at 12th Annual Meeting of American Association of Physicists in Medicine, Washington, D.C., July 13-15:

"Pions and Muons in Medicine" by L. Rosen, MP-DO (invited)

Presentation at International Atomic Energy Agency Panel Meeting on The Analytical Chemistry of Nuclear Fuels, Vienna, Austria, July 13-17:

"Precise Methods for Determining Plutonium and Uranium" by G. R. Waterbury and C. F. Metz, both CMB-1 (invited)

"The Application of Precise Methods in Determining Plutonium and Uranium in Unirradiated Sintered Mixed Oxide Reactor Fuel" by G. R. Waterbury and C. F. Metz, both CMB-1 (invited)

"The Sealed Tube Technique for Dissolving Refractory Materials Including Unirradiated Sintered Mixed Oxide Fuel" by G. R. Waterbury and C. F. Metz, both CMB-1 (invited)

"The Application of Isotope Dilution Mass Spectrometry to the Determination of Uranium and Plutonium in Nuclear Fuels" by J. E. Rein and C. F. Metz, both CMB-1 (invited)

"The Advantages and Limitations of Mass Spectrometry for the Measurement of the Isotope Distributions of Uranium and Plutonium and Its Application to Nuclear Fuel Burnup" by J. E. Rein and C. F. Metz, both CMB-1 (invited)

"The Determination of Nuclear Fuel Burnup Based on Isotope Dilution Mass Spectrometric Measurements" by J. E. Rein and C. F. Metz, both CMB-1 (invited)

Presentation at McMasters University, Hamilton, Ontario, Canada, July 17.:

"The Los Alamos Lamb-Shift Source of Polarized Negative Ions and Experience at 7-16 MeV with Deuteron and Proton Reactions" by J. L. McKibben, P-9

Presentation at radiation biology seminar, Department of Biology, University of New Mexico, Albuquerque, July 20:

"Biochemical Events in the Cell Cycle" by D. F. Petersen, H-4 (invited)

Presentation at the Second International Conference on Atomic Physics, Oxford, England, July 21-24:

"The Atomic Structure of Super-Heavy Elements" by R. D. Cowan, T-DOT and J. B. Mann, CMF-4 (invited)

"Evaluation of the Free-Free Absorption Coefficient of Negative Atomic Ions from Elastic Scattering Data" by R. C. Mjolsness and H. M. Ruppel, both T-9

Presentation at radiation biology seminar, Department of Biology, University of New Mexico, Albuquerque, July 22:

"Radiation Effects in the Cell Cycle" by R. A. Walters, H-4 (invited) (invited)

Presentation at a Department of Microbiology and Public Health Seminar, Michigan State University, East Lansing, July 28:

"Regulation of Genome Replication in Mamallian Cells Grown **In Vitro**" by R. A. Tobey, H-4 (invited)

Presentation at seminar, Ames Research Center, Moffett Field, Calif., July 31:

"Speculations on the Nature of Ball Lightning with a Review of Current Theories" by J. L. Tuck, P-DO

Presentation at Ninth International Congress on High-Speed Photography, Denver, Colo., Aug. 2-7:

"Extended Range High-Speed Framing Camera" by B. Brixner, GMX-9 and A. Johnson, EG&G,

Boston, and O. W. Niemi, Lawrence Radiation Laboratory, Livermore, Calif.

Presentation at Gordon Research Conference on Solid State Ceramics, Merridan, N.H., Aug. 3-7:

"High Temperature and Thermodynamic Behavior of Metal Hemi Carbides" by E. K. Storms and A. L. Bowman, both CMB-3

Presentation at Gordon Conference on Inorganic Chemistry, New Hampton, N.H., Aug. 3-7:

"Unusual Oxidation States of the Actinides" by L. B. Asprey, CMF14 (invited)

Presentation at seminar, National Cancer Institute, Cytopathology Section, Bethesda, Md., Aug. 4:

"Automated Cell Analysis: An Integrated System" by M. J. Fulwyler and M. A. Van Dilla, both H-4 (invited)

Presentation at Second International Conference on the Strength of Metals and Alloys, Pacific Grove, Calif., Aug. 3-Sept. 4:

"High-Temperature Creep of Polycrystalline Graphite" by W. V. Green and E. G. Zukas, both CMF-13 and J. Weertman, Northwestern University, Evanston, Ill.

Presentation at International Astronomical Union Symposium No. 44, External Galaxies and Quasi-Stellar Objects, Uppsala, Sweden, Aug. 10-14:

"Can the Optical Fluctuations of 3C 273 Be Random?" by N. J. Terrell, Jr., P-DOR and K. H. Olsen, J-15

Presentation at seminar, Space Sciences Laboratory, University of California, Richmond, Aug. 11:

"Structural Alteration of Histones" by G. R. Shepherd, H-4 (invited)

Presentation at seminar, Department of Biochemistry, University of California, Berkeley, Aug. 12:

"Structural Alterations of Histones" by G. R. Shepherd, H-4 (invited)

"Acetylation, Methylation and Phosphorylation of Histone Fractions in Synchronized Mammalian Cell Cultures" by G. R. Shepherd, H-4 (invited)

Presentation at colloquium, Physics Department, University of California, Los Angeles, Aug. 13:

"On the Formation and Structure of Electrostatic Collisionless Shocks" by D. W. Forslund, T-12 and C. R. Shonk, J-10 (invited)

Presentation at meeting of the American Crystallographic Association, Ottawa, Canada, Aug. 16-21:

"The Crystal Structure of YCd_6" by A. C. Larson and D. T. Cromer, both CMF-5

Presentation at panel on intermediate energy physics, Summer School, Banff, Alberta, Canada, Aug. 18:

"Discussion on Intermediate Energy Machine" by D. E. Nagle, MP-DO

Presentation at Atomic Weapons Research Establishment, Aldermaston, England, Aug. 18:

"Scientific Applications of Nuclear Explosions: Neutron Cross Sections" by M. G. Silbert, P-DOR

Presentation at Fifth Symposium on Detonation, Pasadena, Calif., Aug. 18-21:

"Numerical Calculations of Detonation Failure and Shock Initiation" by C. L. Mader, T-5

"Spherical Explosions in Water" by L. W. Hantel, GMX-2 and W. C. Davis, GMX-8

"Pressure Measurements for Composition B-3" by W. C. Davis, GMX-8 and D. Venable, GMX-11

"Flash X-ray Observation of Marked Mass Points in Explosive Products" by W. C. Rivard and W. Fickett, both GMX-10, and W. C. Davis, GMX-8, and D. Venable, GMX-11

"Measurement of Mass Motion in Detonation Products By An Axially-Symmetric Electromagnetic Technique" by B. Hayes, GMX-8, and J. N. Fritz, GMX-6

"Decomposition of a Solid Explosive When Shocked But Not Detonated" by B. G. Craig, GMX-8, and Elisabeth F. Marshall, GMX-4

Presentation at Computers in Undergraduate Science Seminar, Illinois Institute of Technology, Chicago, Aug. 19:

"Computers and Motion Pictures" by J. P. Shannon, T-3 (invited)

Presentation at Colloquium on Plasma Simulation to Computing Center Staff, Argonne National Laboratory, Ill., Aug. 20:

"Plasma Simulation" by R. L. Morse, P-18 (invited)

Presentation at University of Washington, Seattle, Aug. 20:

"Second Order Nuclear Quadrupole Effects in Polycrystalline Solids" by E. Fukushima, CMF-4 (invited)

Presentation at 15th International Conference on High Energy Physics, Kiev, Russia, Aug. 26-Sept. 4:

"Cross Sections for $p+p \rightarrow d+p^+$ from 4.0 to 12.3 GeV/c" by D. E. Nagle, MP-DO; H. A. Thiessen, MP-7; H. L. Anderson, M. Dixit, H. J. Evans, K. A. Klyare, D. A. Larson, M. V Sherbrook, all University of Chicago; R. L. Martin, Argonne National Laboratory; D. Kessler, E. P. Hincks, Carleton University, Canada; S. Fukui, Nagoya University, Japan; and C. K. Hargrove, National Research Council of Canada, Ottawa

Presentation at summer school, Banff, Canada, Aug. 27:

"Pion Production By 730-MeV Protons" by D. E. Nagle, MP-DO

Presentation at the TRIUMF Annual Meeting, Banff, Alberta, Canada, Aug. 29:

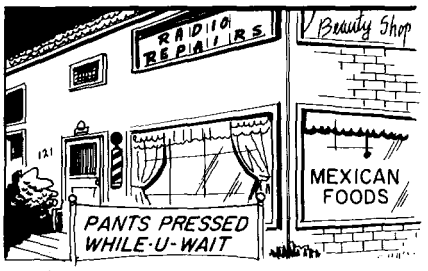
"Pion Production By 730-MeV Protons on Hydrogen and Other Nuclei; Status of LAMPF" by D. E. Nagle, MP-DO (invited)

Presentation at American Institute of Chemical Engineers Meeting, Denver, Colo., Aug. 29-Sept. 2:

"Storage and Handling of Cryogens" by F. J. Edeskuty, CMF-9 (invited)

"Void Fraction and Related Measurements in Two-Phase Cryogenic Flow Systems" by K. D. Williamson, Jr., CMF-9 (invited)

20 years ago in los alamos



Culled from the Oct., 1950 files of the Santa Fe New Mexican by Robert Porton

AEC Seeks Policy on Home Businesses

A policy to control the Hill's uncounted "home businesses" is under study according to the Atomic Energy Commission. In addition to the concessions conducted in government-allotted commercial space, Los Alamos has numerous small enterprises in private homes. Three home businesses have commercial phones, but an additional 21 listed in the classified directory are apparently operating under private party rates. The concerns offer services ranging from Mexican food through radio repairs.

AEC Medics Meet at Laboratory

The AEC's top medical authorities wound up a three-day session here. The Los Alamos Scientific Laboratory was host to 41 medical and laboratory directors from the Commission's installations and contractors. This was the first time the annual conference was held at Los Alamos. Dr. Shields Warren, Director of the AEC's Division of Biology and Medicine, termed the meeting a success and spoke of increased understanding of radiation.

Los Alamos Drinkers Win Long Bout

The New Mexico Director of Liquor Control this week knocked down the last barrier to the establishment of a public cocktail lounge in Los Alamos. Tom Montoya approved a dispenser's license at Fuller Lodge. Previously, all drinking in Los Alamos has been confined to private clubs. Non-club members on the Hill have been advocating for some time the establishment of such a facility. The Lodge's chief function is the accommodation of official visitors. It is run by the Zia Company as part of a contract with the AEC.

William Crew Named Assistant to the Director

Norris E. Bradbury, Director of the LASL, has announced the appointment of Dr. William H. Crew, to the newly-created post of Assistant Director of Scientific Personnel. Dr. Crew is a graduate of the United States Naval Academy. Prior to coming to Los Alamos, the physician-administrator was dean of the College of Engineering Sciences, United States Air Force Institute of Technology, Dayton, Ohio.

what's doing

NEWCOMERS—Oct. 28, 7:30 p.m., Los Alamos National Bank: Mrs. Phillip Koontz, "Early Days of Los Alamos." For information call Judy Ware, 662-5745.

LOS ALAMOS FILM SOCIETY—Oct. 28, 7:30 p.m., Civic Auditorium: "The Cranes are Flying." Admission: members—$.75; others—$2.00.

RIO GRANDE RIVER RUNNERS—Meetings scheduled for noon, second Tuesday of each month at South Mesa Cafeteria. For information call Joan Chellis, 662-3836.

LOS ALAMOS CONCERT ASSOCIATION—Oct. 29, 8:15 p.m., Civic Auditorium: Sidney Foster, pianist. Season tickets available at door. For information call Margaret Hagerman, 662-7389.

MOUNTAIN MIXERS SQUARE DANCE CLUB—For information call Mrs. Joyce Headdy, 672-378.

Oct. 3—Canyon School, 8 p.m., Donald Shaw, Roswell, caller

Oct. 17—Canyon School, 8 p.m., Harry "Bones" Craig, caller

PUBLIC SWIMMING—High School Pool—Monday through Wednesday, 7:30 to 9 p.m., Saturday and Sunday, 1 to 6 p.m., Adult Swim Club, Sunday, 7 to 9 p.m.

SIERRA CLUB—Luncheon meeting at noon, first Tuesday of each month, South Mesa Cafeteria. For information call Brant Calkin, 455-2468, Santa Fe.

MESA PUBLIC LIBRARY—Travel Exhibit Program, 7:30 p.m., Mesa Public Library.

Oct. 6—Kay Harper, "Maya-land; Wet and Dry."

Oct. 20—Mary and Louis Rosen, "Uganda, Tanzania and Kenya."

Nov. 3—John Young, "Hawaii."

EXHIBITS—Sept. 9 through Oct. 6—UNICEF

Oct. 7 through Nov. 7—United Fund

Oct. 8 through Nov. 17—"Cooking with Copper"

Sept. 8 through Oct. 5—Maria Riley, oil paintings

Oct. 5 through Oct. 29—Betty Lindberg, paintings

OUTDOOR ASSOCIATION—No charge, open to the public. Contact leaders for information regarding specific hikes.

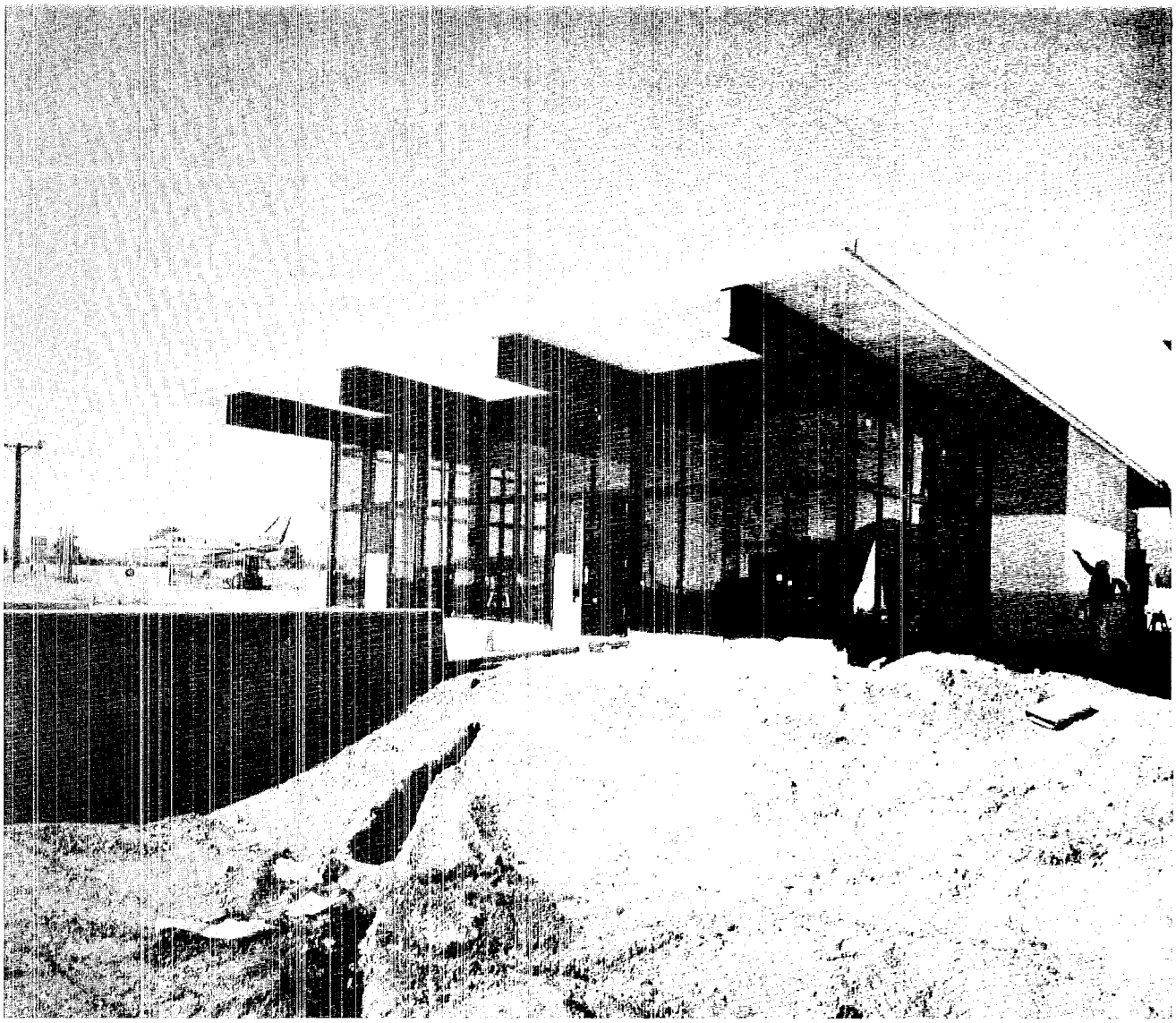
Oct. 3—Clean-up Cruise, Walter Green, 672-3203

Oct. 11—Red River to Dunn's Bridge, Walter Green, 672-3203

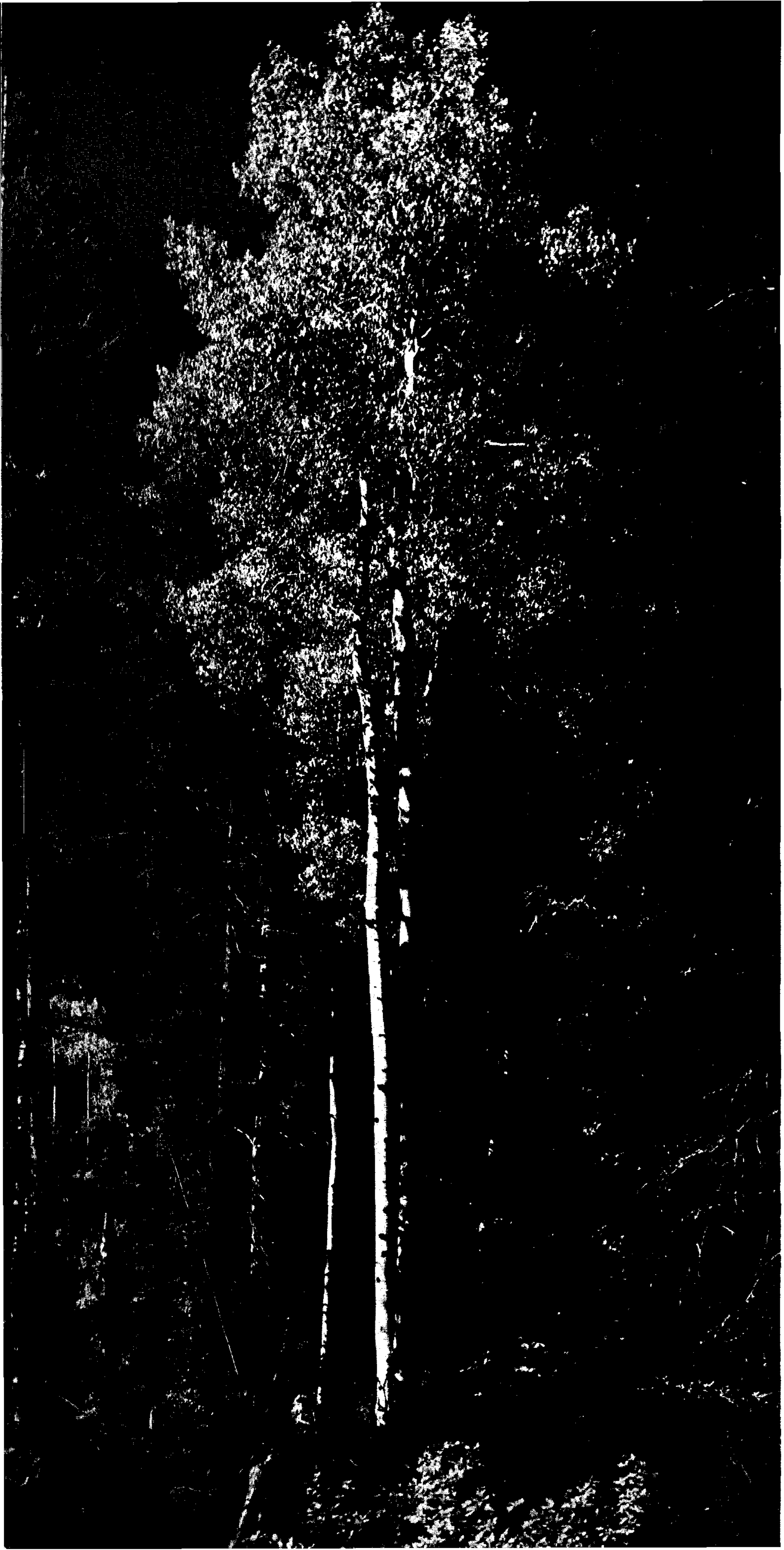
Oct. 17—Cabresto or Wheeler Peak, Ed Kmetko, 662-7911

Oct. 24—Monastery to Echo Amphitheater, Bob Skaggs, 255-2939

Oct. 25—Cottonwood Cruise, Stretch Fretwell, 662-6477



The new Los Alamos airport terminal is expected to be completed and ready for occupancy in mid-October. The "modern look" and increased size will provide a more efficient and pleasant setting for users.



Proof that autumn is here is shown in this photograph taken by Bill Jack Rodgers.

Henry T. Motz
3187 Woodland
Los Alamos, New Mexico 87544